

From: Whittaker, Laura [laura.whittaker@aptim.com]

Sent: Friday, August 17, 2018 6:21 AM

To: Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]

CC: Slack, Matthew L CIV SEA 04 04N [matthew.slack@navy.mil]; Howard, Leslie A CIV NAVFAC SW [leslie.howard@navy.mil]; Noble, Kimberly K CIV SEA 04, NAVSEA DET RASO [kimberly.k.noble1@navy.mil]; Johnson, Nels [Nels.Johnson@aptim.com]; Schul, Raymond [raymond.schul@aptim.com]; Guillory, Jeffrey [jeffrey.guillory@aptim.com]; Meldrum, Amy [amy.meldrum@aptim.com]; Hanelt, Norm [Norm.Hanelt@aptim.com]; Killpack, Randall [randall.killpack@aptim.com]; Gerg, David [david.gerg@aptim.com]; Chi, Minhsec [minhsec.chi@aptim.com]; Orman, Sean [sean.orman@aptim.com]; Rogers, Bryon [bryon.rogers@aptim.com]

Subject: [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY C9 (Use 12)

Attachments: HPNS APTIM RSY C9 (Use 12) Soil Non-LLRW Concurrence Request 08172018 (reduced).pdf

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

If there are any questions or if additional data is required, please contact me.

Thank you.



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APTIM
Hunters Point Naval Shipyard
200 Fisher Avenue
San Francisco, CA 94124



Hunters Point Naval Shipyard, Parcel E-2 RSY Data Report

Contract No. EMAC III CTO-0013			
RSY Pad: C9	RSY Pad Use Number: USE 12	First Submittal <input checked="" type="checkbox"/>	Second Submittal <input type="checkbox"/>
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 08/17/2018	

Soil Sample Data						
Sample Identification	Survey Location	Type of Sample	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁶⁰ Co Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
Upper limit of site reference background			1.633	0.113	0.252	0.331
PE2-RSYC9-U12-S001	1	Systematic	0.644	-0.0142	0.0112	-0.0212
PE2-RSYC9-U12-S002	2	Systematic	0.506	0.0194	0.0205	N/A
PE2-RSYC9-U12-S003	3	Systematic	0.495	-0.0496	0.0141	N/A
PE2-RSYC9-U12-S004	4	Systematic	0.517	-0.0468	0.00376	N/A
PE2-RSYC9-U12-S005	5	Systematic	0.632	-0.0459	-0.0321	N/A
PE2-RSYC9-U12-S006	6	Systematic	0.693	0.0547	0.0544	N/A
PE2-RSYC9-U12-S007	7	Systematic	0.598	-0.0204	0.0156	N/A
PE2-RSYC9-U12-S008	8	Systematic	0.449	-0.0367	0.0282	N/A
PE2-RSYC9-U12-S009	9	Systematic	0.564	0.039	-0.0947	N/A
PE2-RSYC9-U12-S010	10	Systematic	0.420	-0.0150	0.0547	N/A
PE2-RSYC9-U12-S011	11	Systematic	0.675	-0.062	-0.0647	0.00686
PE2-RSYC9-U12-S012	12	Systematic	0.421	-0.0359	0.0324	N/A
PE2-RSYC9-U12-S013	13	Systematic	0.374	0.00332	-0.0328	N/A
PE2-RSYC9-U12-S014	14	Systematic	0.551	0.0081	0.0183	N/A
PE2-RSYC9-U12-S015	15	Systematic	0.453	-0.0214	-0.00505	N/A
PE2-RSYC9-U12-S016	16	Systematic	0.434	-0.00051	0.00203	N/A
PE2-RSYC9-U12-S017	17	Systematic	0.548	-0.0313	0.0368	N/A
PE2-RSYC9-U12-S018	18	Systematic	0.506	-0.0423	-0.0521	N/A

¹³⁷Cs Cesium-137
⁶⁰Co Cobalt-60
²²⁶Ra Radium-226
 Sr Strontium
 pCi/g Picocuries per gram

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-07052018-PE2-ROV2-2714	07/05/2018	RS-701/RXS-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,872 CPS	2,721-3,628 CPS
RSI Follow-up Static Survey	HPRS-07102018-PE2-JSS2-2735	07/10/2018	RS-701/RXS-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	3,156-3,549 CPS
Systematic Sample Survey	HPRS-07052018-PE2-JSS-2713	07/05/2018	2221	07/12/2018	271439	15,783 CPM	18,714 CPM	N/A	N/A	13,198-14,391 CPM

3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)
 CPS Counts per second
 CPM Counts per minute

Summary
<p>1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).</p>
<p>2) RSI Follow-up static survey—23 locations identified during the data review process were investigated, with readings less than the Reference Area static IL at all locations for regions of interest (ROIs) 3, 6, 7, 8, and 9 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7).</p>
<p>3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 35-58).</p> <p>Ten percent of the systematic soil samples (two samples in total, PE2-RSYC9-U12-S001 & PE2-RSYC9-U12-S011) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 35-58).</p>
<p>Conclusions:</p> <p>All locations with elevated Z-scores identified by the RSI gamma walkover survey were determined to be consistent with background. 23 locations were investigated during the follow-up static survey, with readings less than the Reference Area static IL at all locations for ROIs 3, 6, 7, 8, and 9 (VD1). Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 9-31).</p> <p>Final analytical results for systematic samples from this RSY pad are concluded to be comparable to background. Histograms showing soil sample activity concentrations are provided (pages 32-34). Ten percent of the systematic soil samples (two samples in total, PE2-RSYC9-U12-S001 & PE2-RSYC9-U12-S011) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1).</p> <p>RSY C9 (Use 12) contains soil from Survey Unit areas undergoing revetment construction.</p> <p>APTIM request RASO concurrence to release this soil as Non-LLRW.</p> <p>Disposition: This soil shall be dispositioned as non-LLRW waste to be stockpiled onsite following appropriate chemical characterization.</p>

RSI Data Evaluation Process

RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- **Playback Review:** The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- **Count Rate Time Series Review:** The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- **All ROIs:**
 - **Z-Scores:** The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three ($Z > 3$) is marked for follow-up.
 - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local $Z > 3$ is marked for follow-up.
 - **Semi-local Z-Scores:** Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local $Z > 3$ is marked for follow-up.
- **ROIs 3, 6, 8, and 10 (radium-specific ROIs):**
 - Z-Scores: The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local $Z > 3$ is marked for follow-up.

- **ROI 7 (cesium-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **ROI 9 (cobalt-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **Z-Score Time Series Review:** The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score > 3 in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

Where:

$$L_C = 2.33\sqrt{B}$$

LC = critical level (counts)
 B = average background in the ROI

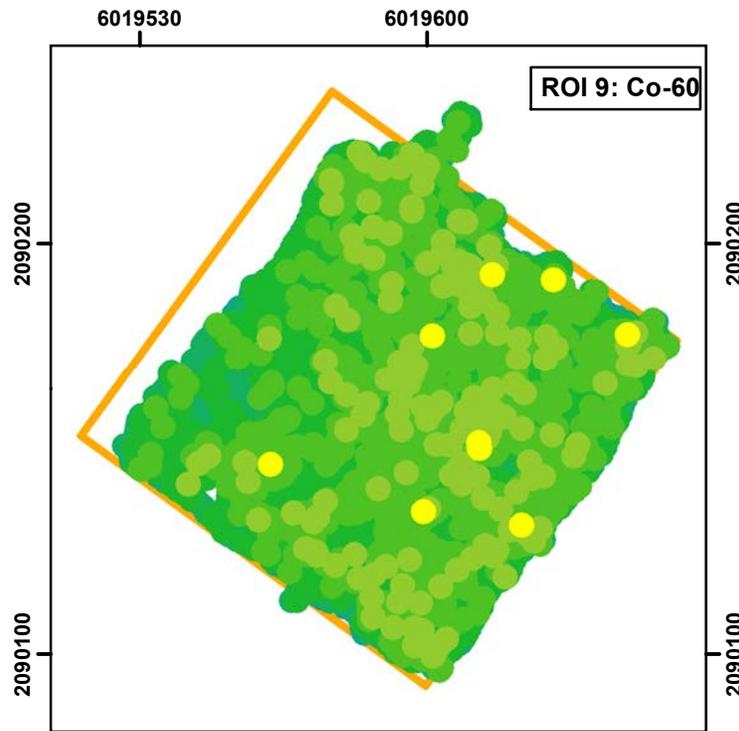
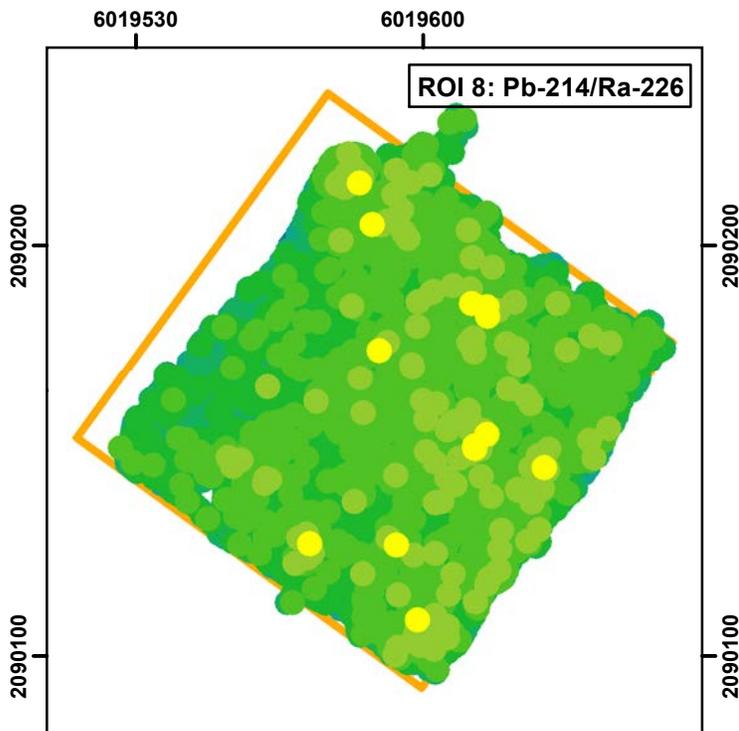
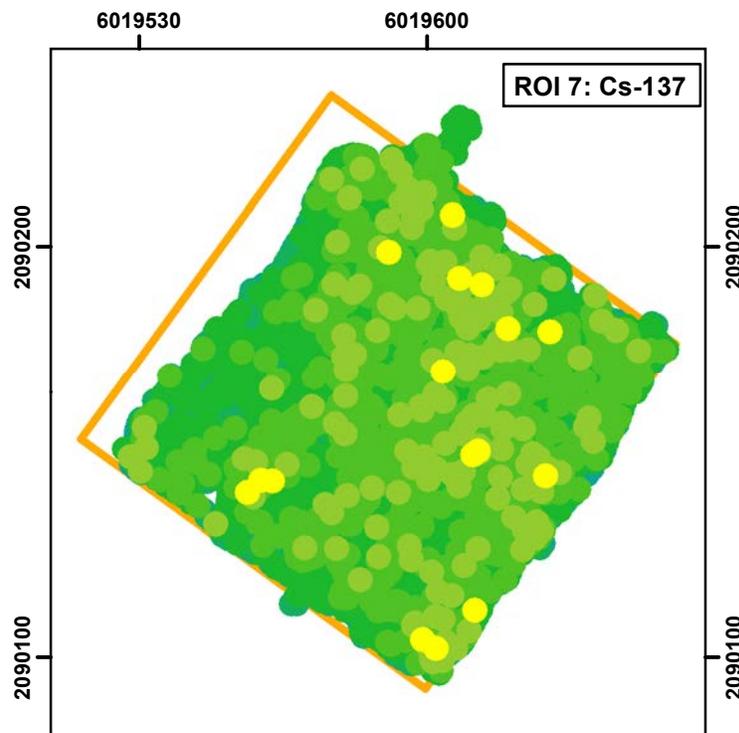
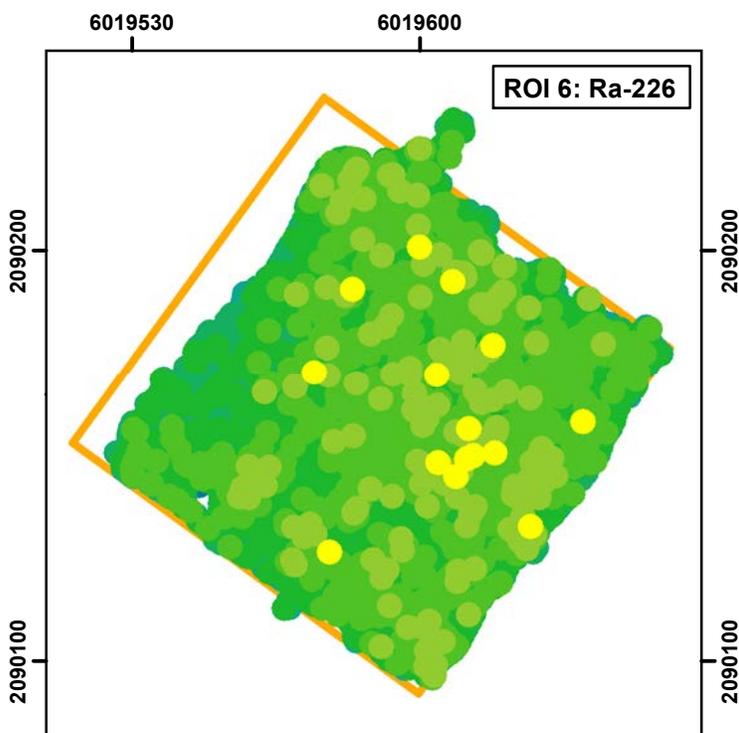
When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.

Contour Map

HPNS Parcel E-2
RSY Pad C9 (Use 12)

Soil Excavation Site:
Revetment Spoils



RS-700 Gamma Walkover Data (VD1)

- | | |
|--|--|
| ● > 3 std dev | ● > -1 to < 0 std dev |
| ● > 2 to < 3 std dev | ● > -2 to < -1 std dev |
| ● > 1 to < 2 std dev | ● > -3 to < -2 std dev |
| ● > 0 to < 1 std dev | ● < -3 std dev |
- RSY Pad Boundaries



Coordinate system: CSP Zone III. NAD83, US Survey Foot



RSI Review Summary

Summary:

23 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on gamma static data at these locations do not indicate the presence of ^{226}Ra , ^{137}Cs , or ^{60}Co above background. Gamma static readings at these locations are less than the Reference Area static IL for ROIs 3, 6, 7, 8, and 9; figures are provided on pages 9-31.

RSI Follow-up Static Survey
HPRS-07102018-PE2-JSS2-2735

HPNS Parcel E-2 RSY Pad C9 (Use 12)

Soil Excavation Site:
Retevment Spoils

6019530

6019600

6019670

2090300

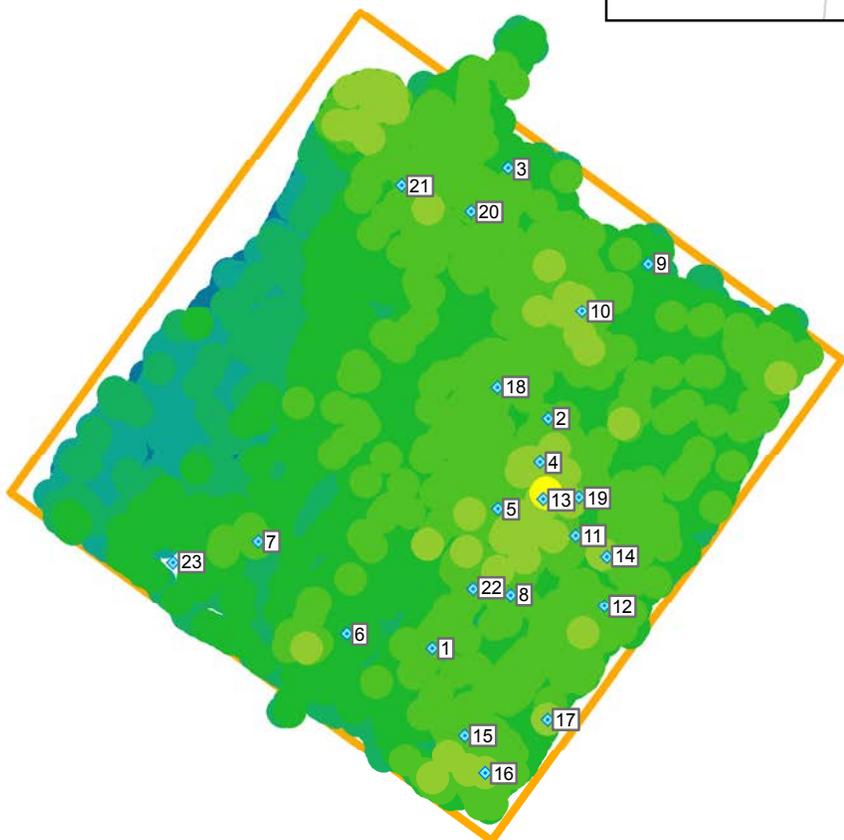
2090300

2090200

2090200

2090100

2090100



RS 700 Gamma Walkover Survey Data (VD1, ROI 10)

- ◆ Follow-up Locations
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev
- RSY Pad Boundaries



Coordinate system: CSP Zone III. NAD83, US Survey Foot



Systematic Sample Survey
HPRS-07052018-PE2-JSS-2713

HPNS Parcel E-2 RSY Pad C9 (Use 12)

Soil Excavation Site:
Retevment Spoils

6019530

6019600

6019670

2090300

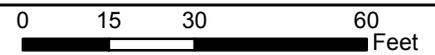
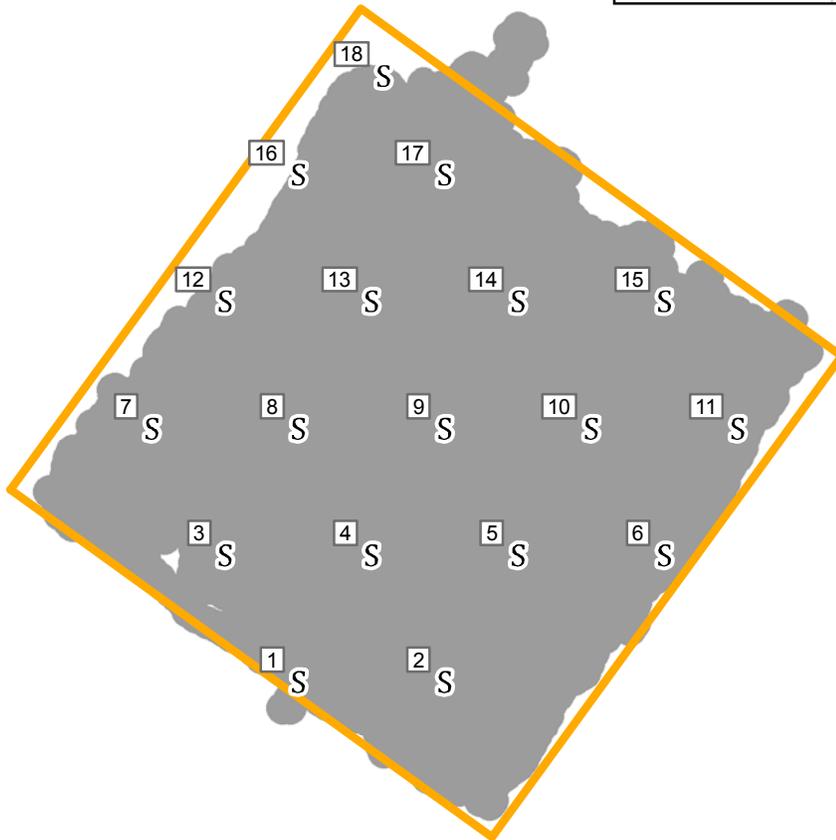
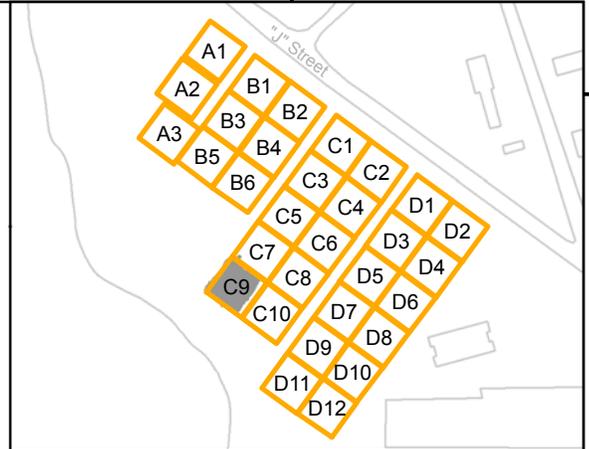
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2090200

2090100

2090100

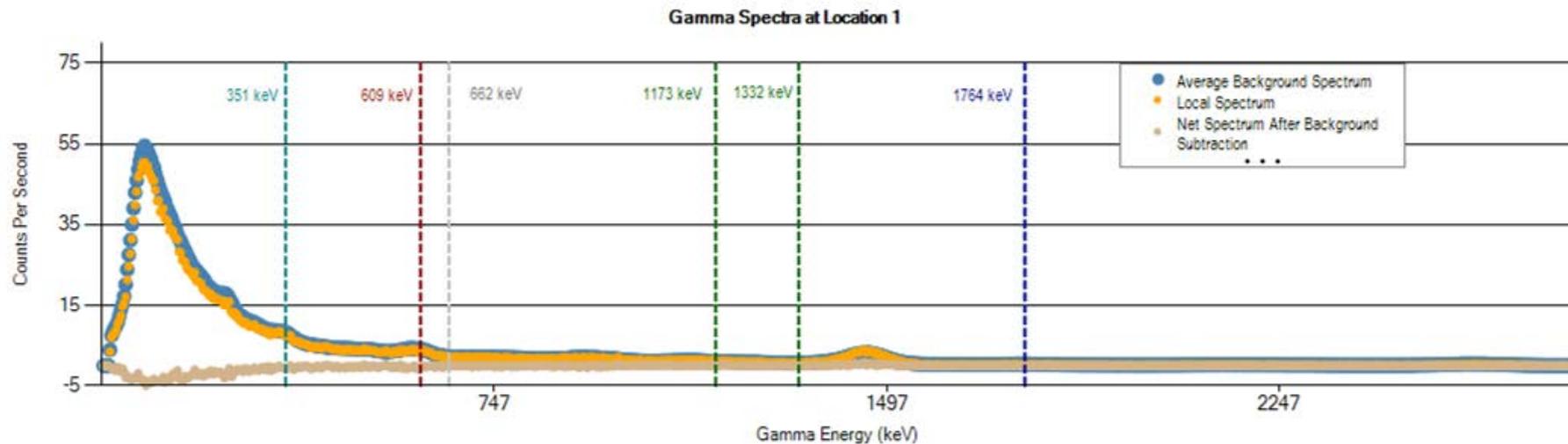
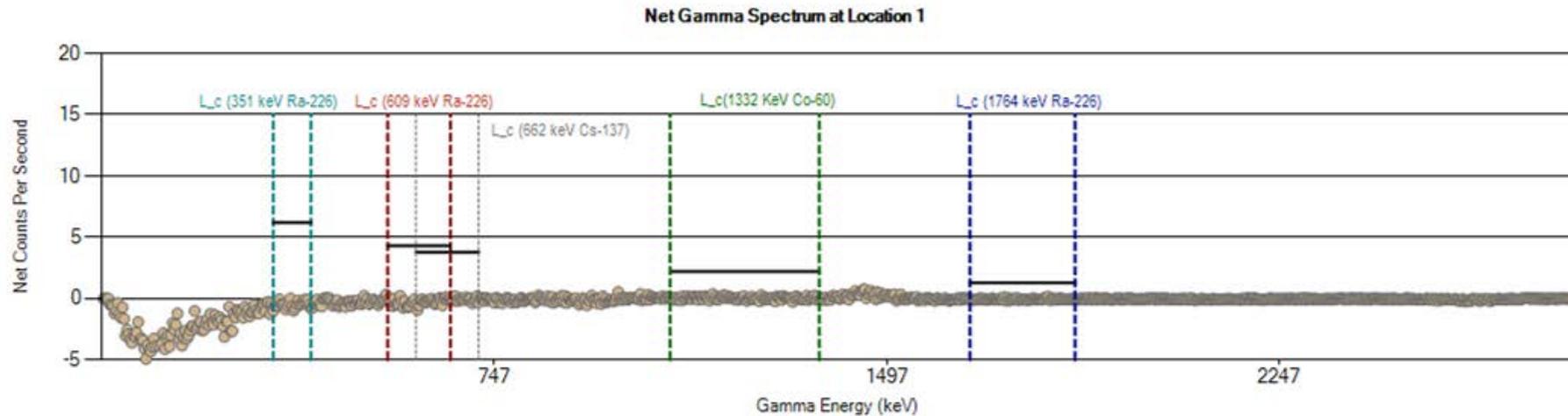


Coordinate system: CSP Zone III. NAD83, US Survey Foot

Survey Instrument: Model 2221/ 44-20
Serial Number: 271439

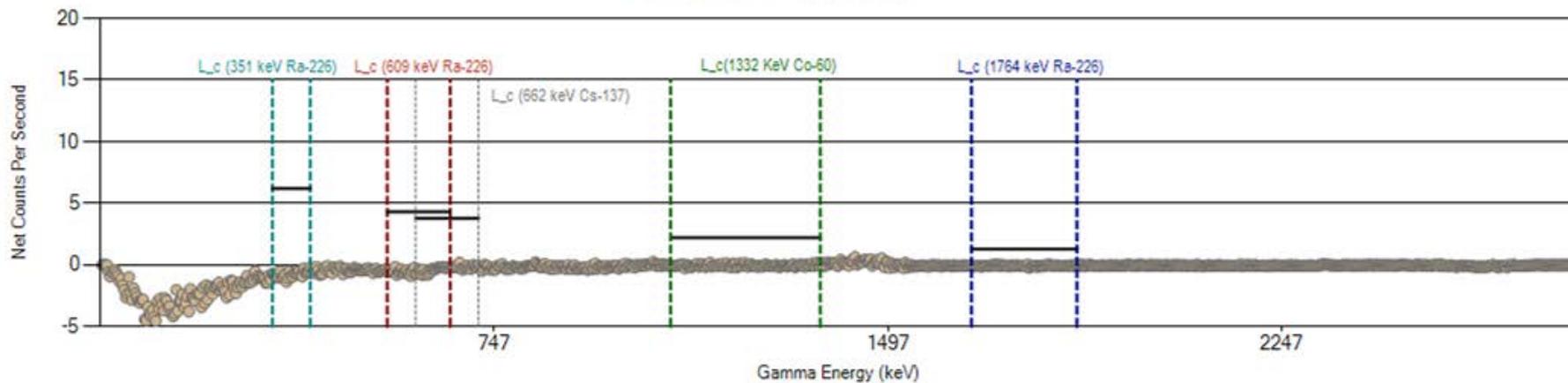
-  Systematic Sample Locations
-  RS-700 GWS Scan Coverage
-  RSY Pad Boundaries



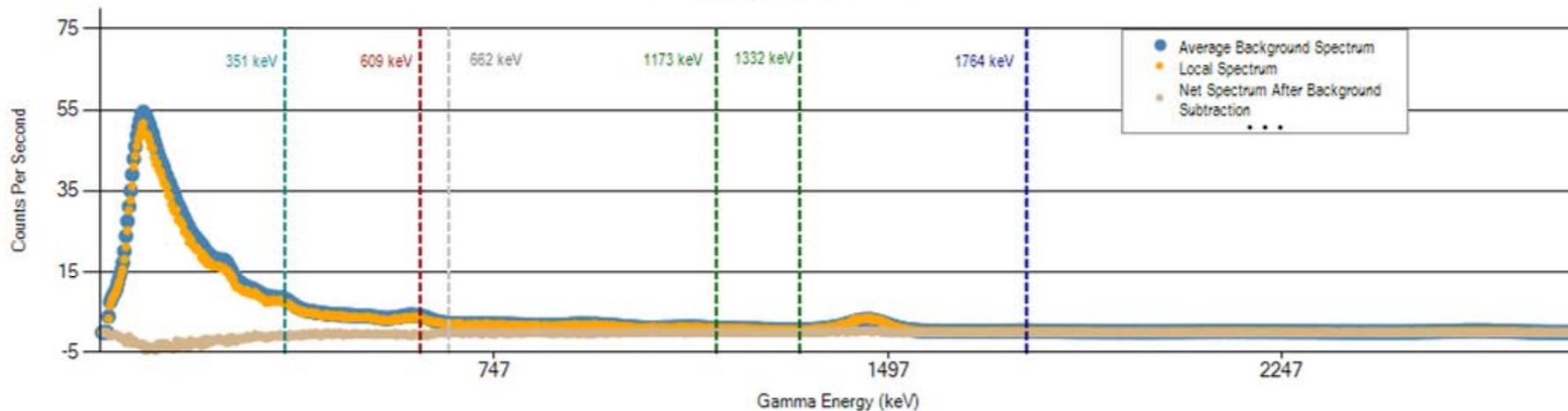


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 1 (cps)	823	126	17	18	142	129	102	163	92	3342
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

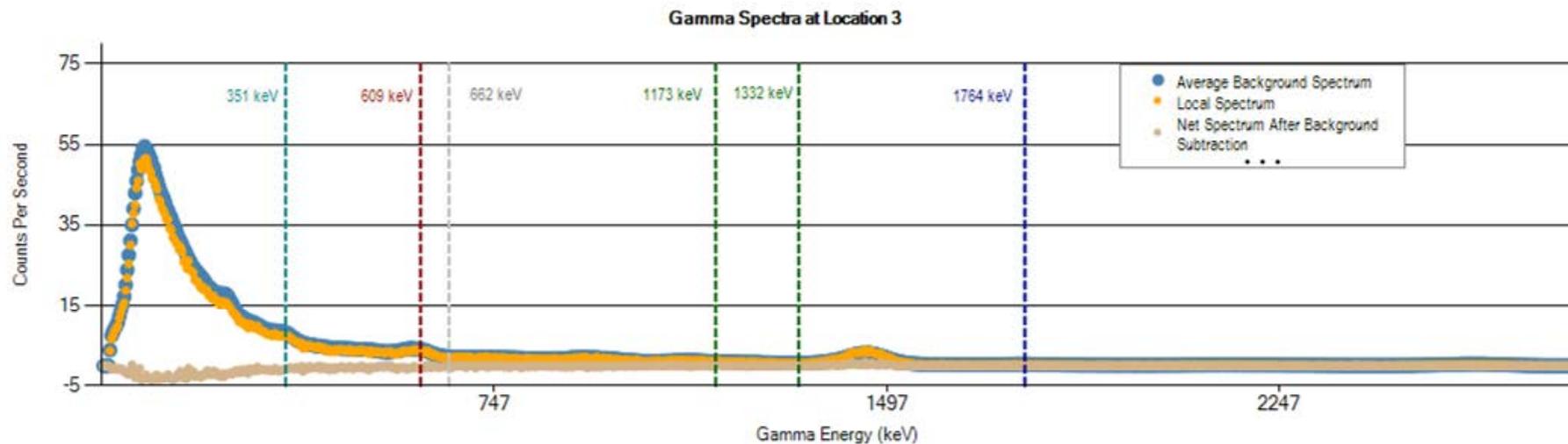
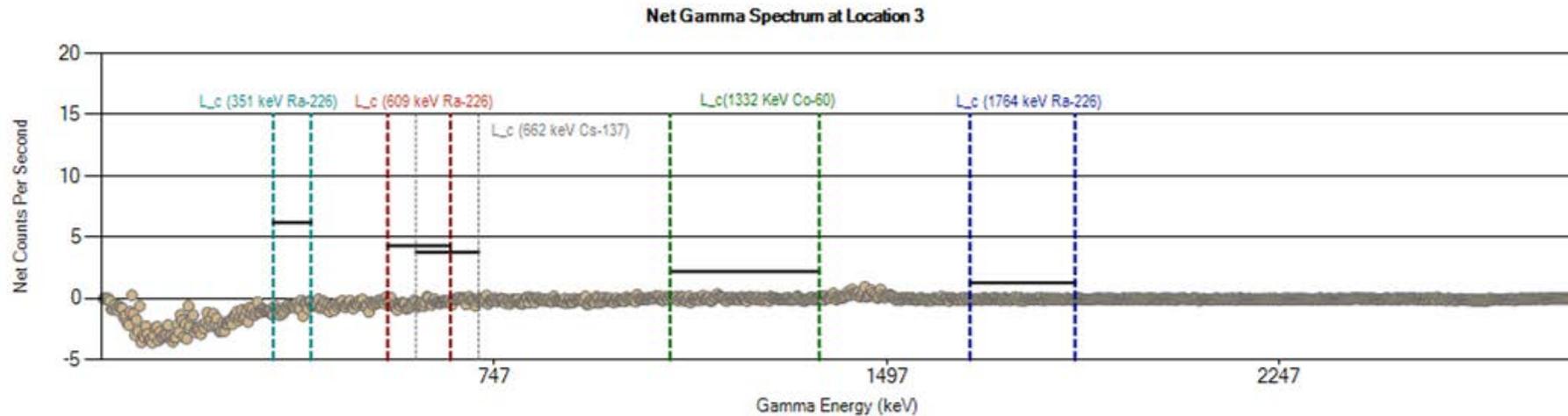
Net Gamma Spectrum at Location 2



Gamma Spectra at Location 2

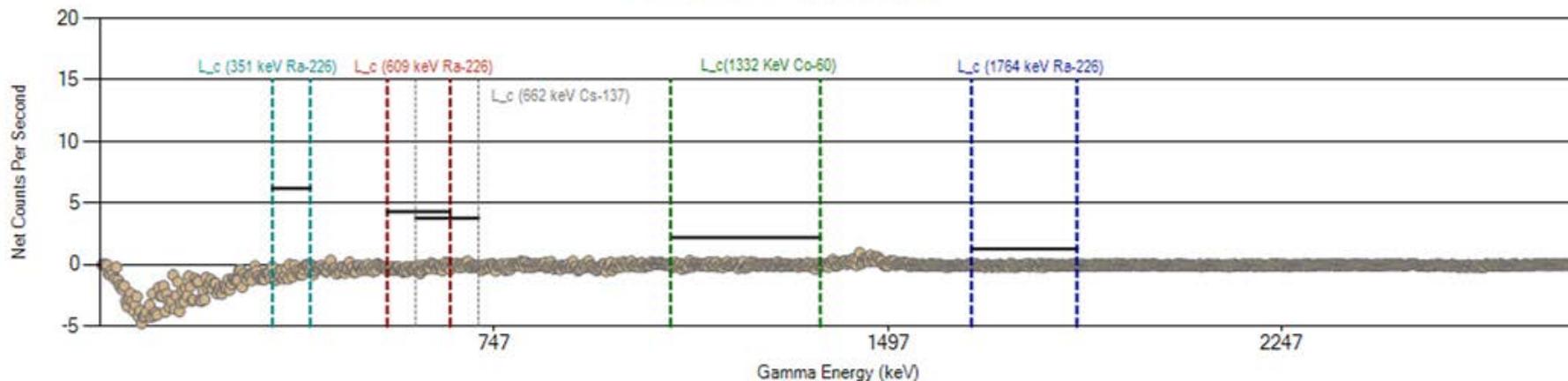


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 2 (cps)	781	122	16	18	134	122	96	155	85	3287
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

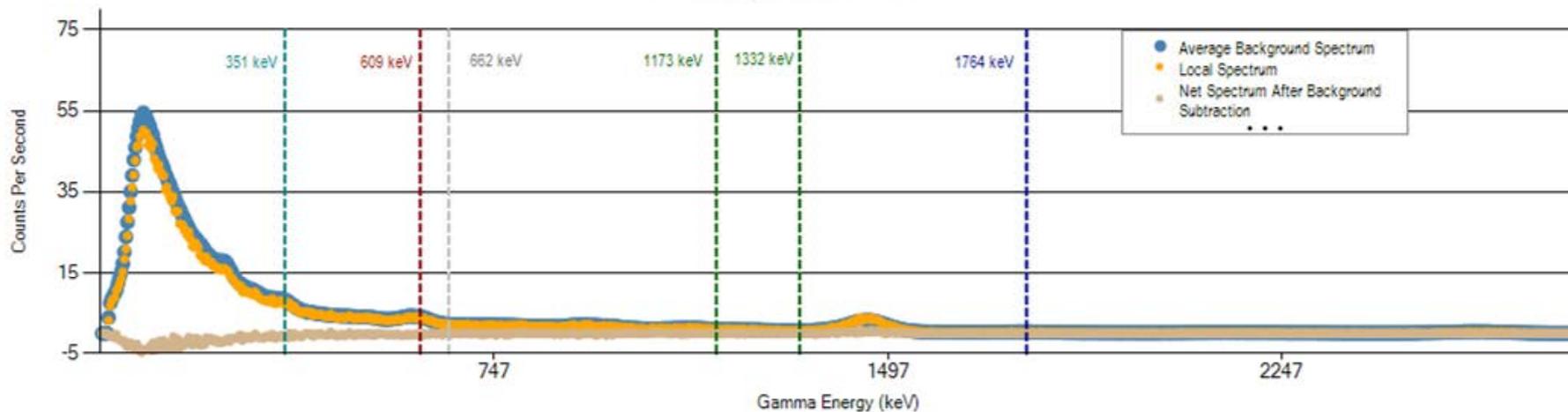


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 3 (cps)	798	126	17	18	135	124	98	156	88	3337
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 4

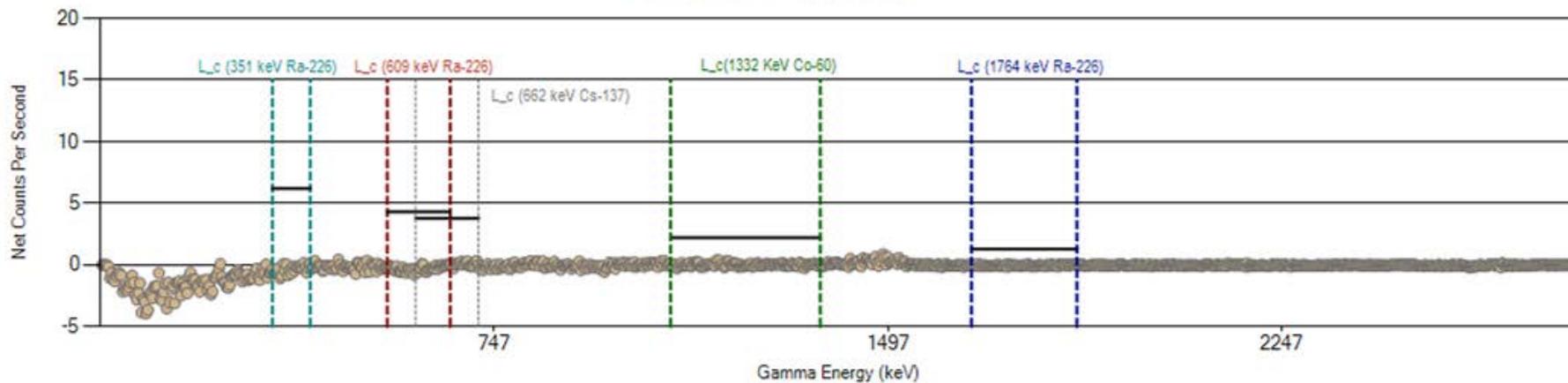


Gamma Spectra at Location 4

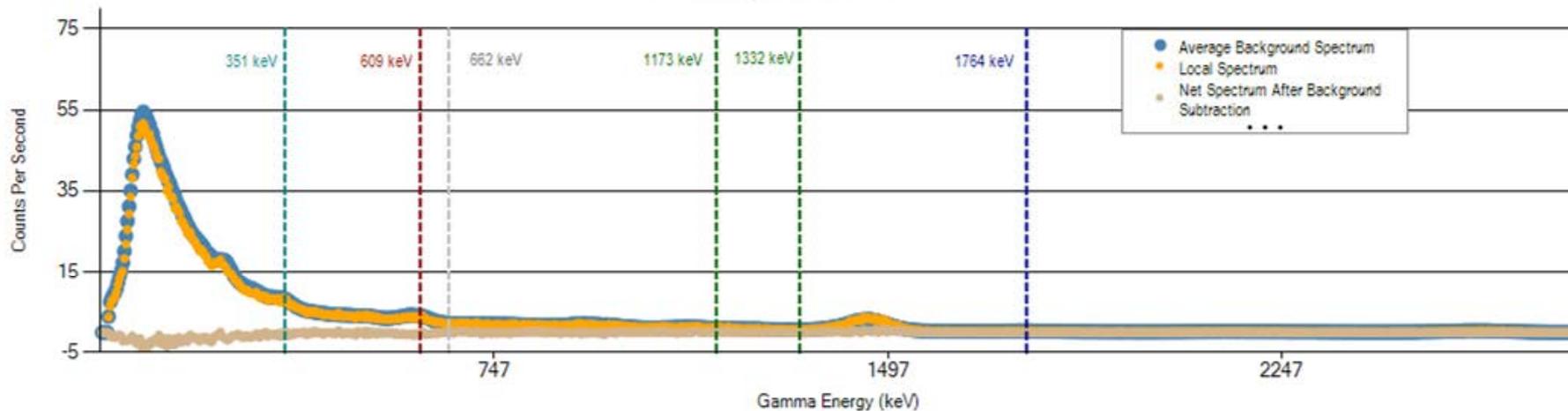


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 4 (cps)	818	126	17	20	141	130	102	160	87	3347
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 5

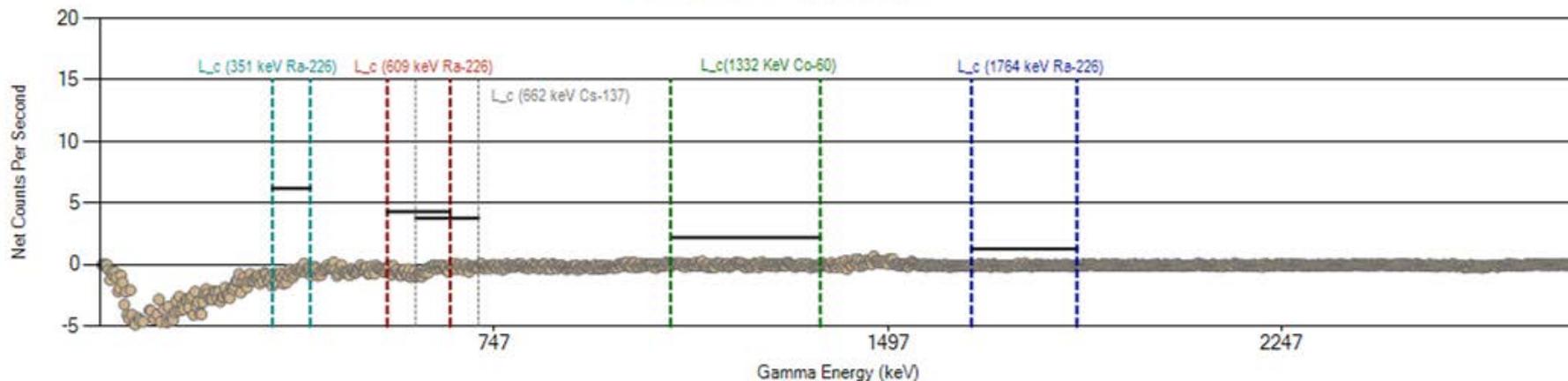


Gamma Spectra at Location 5

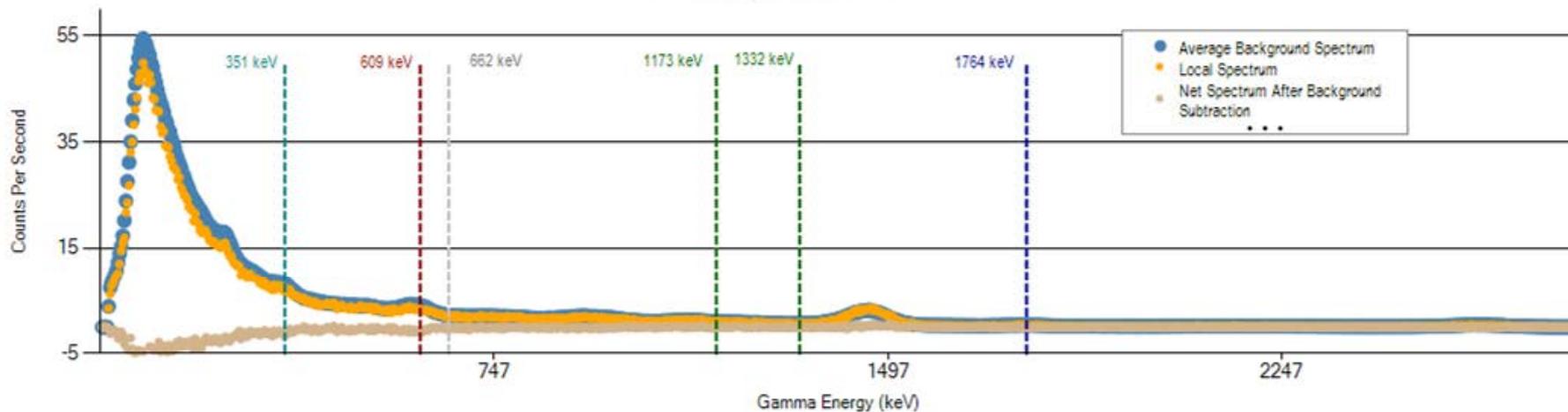


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 5 (cps)	834	127	18	20	143	129	104	166	90	3428
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 6

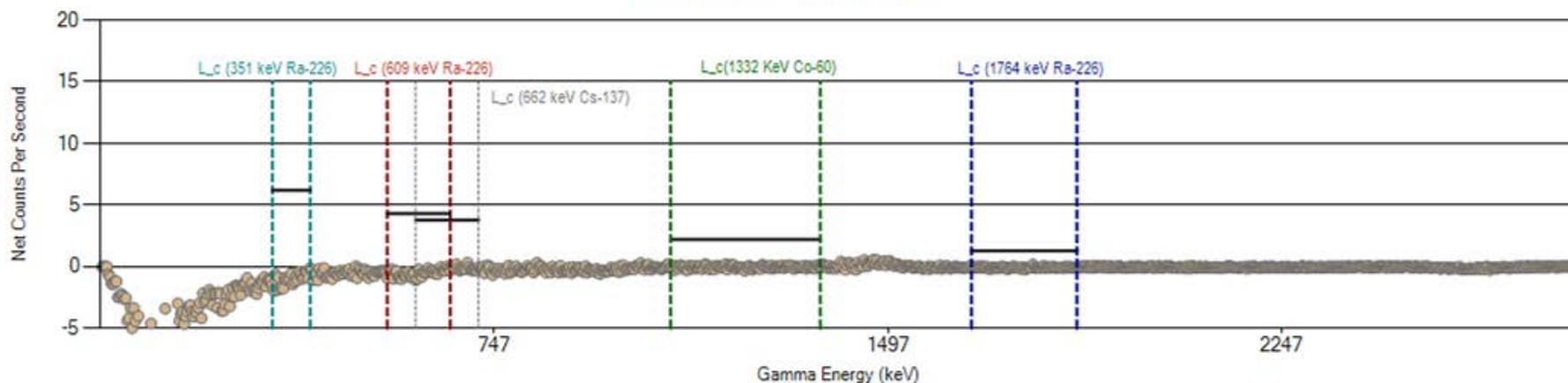


Gamma Spectra at Location 6

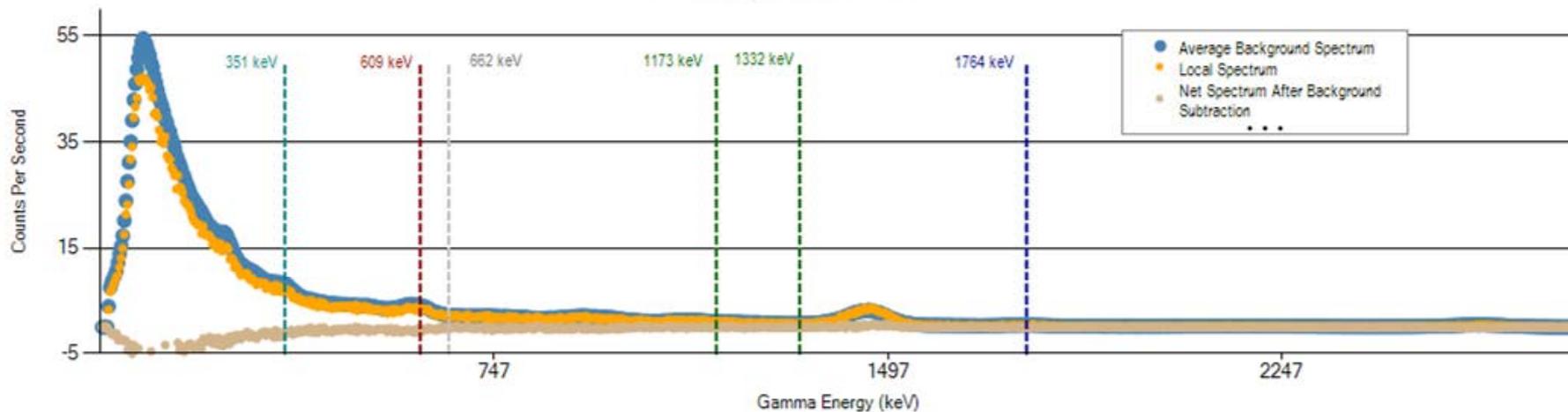


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 6 (cps)	787	121	16	19	133	120	96	157	88	3236
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 7

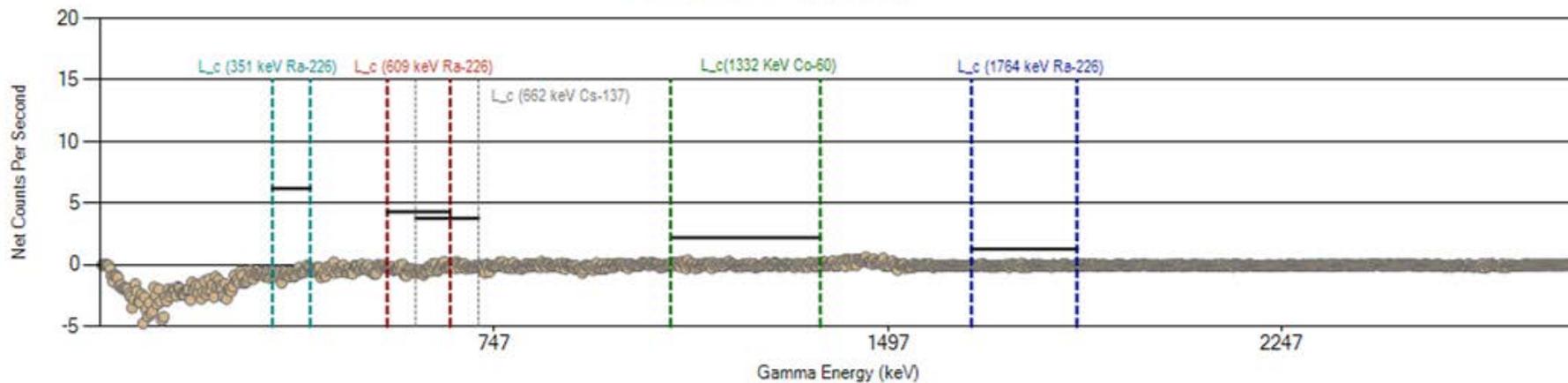


Gamma Spectra at Location 7

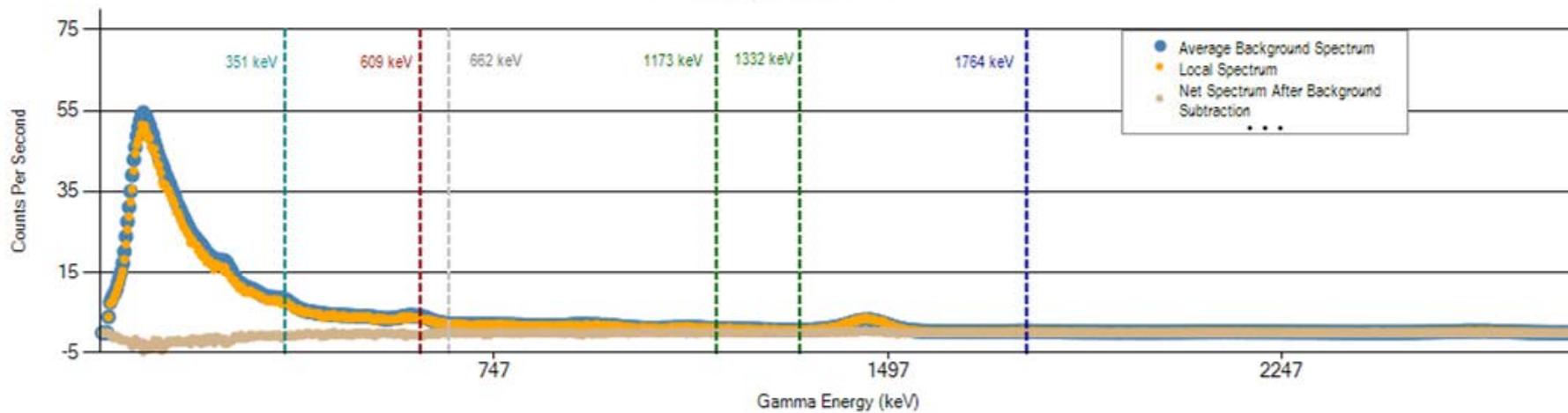


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 7 (cps)	771	123	16	17	132	120	97	150	85	3156
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

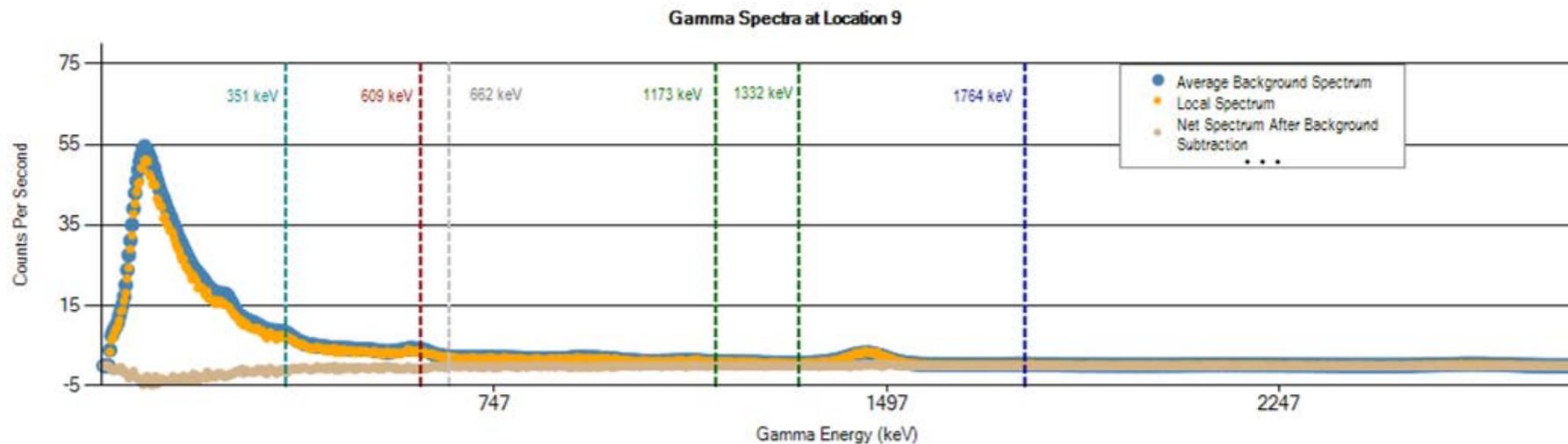
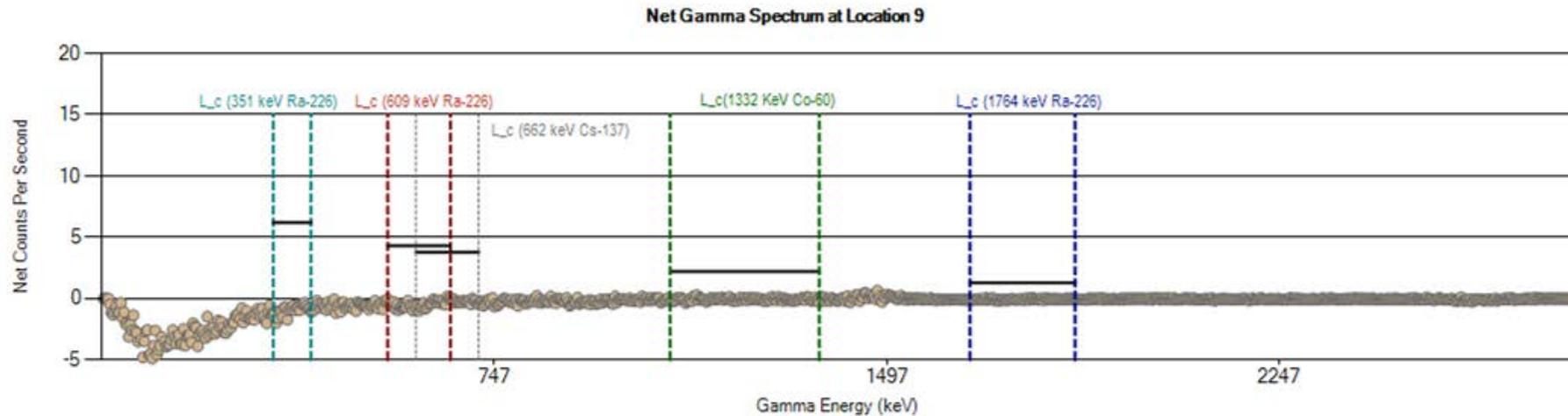
Net Gamma Spectrum at Location 8



Gamma Spectra at Location 8

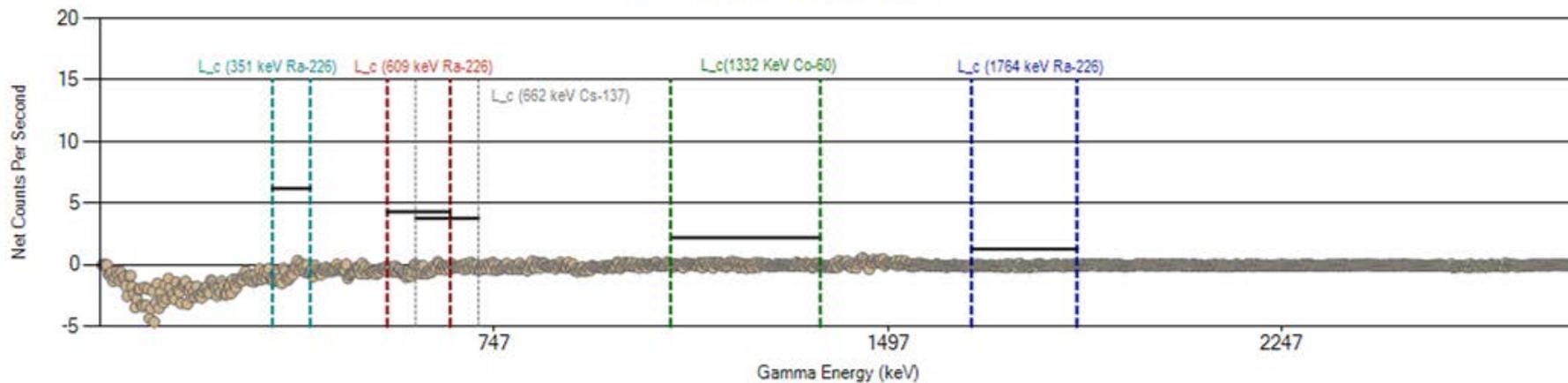


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 8 (cps)	808	123	17	20	140	127	100	159	89	3350
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

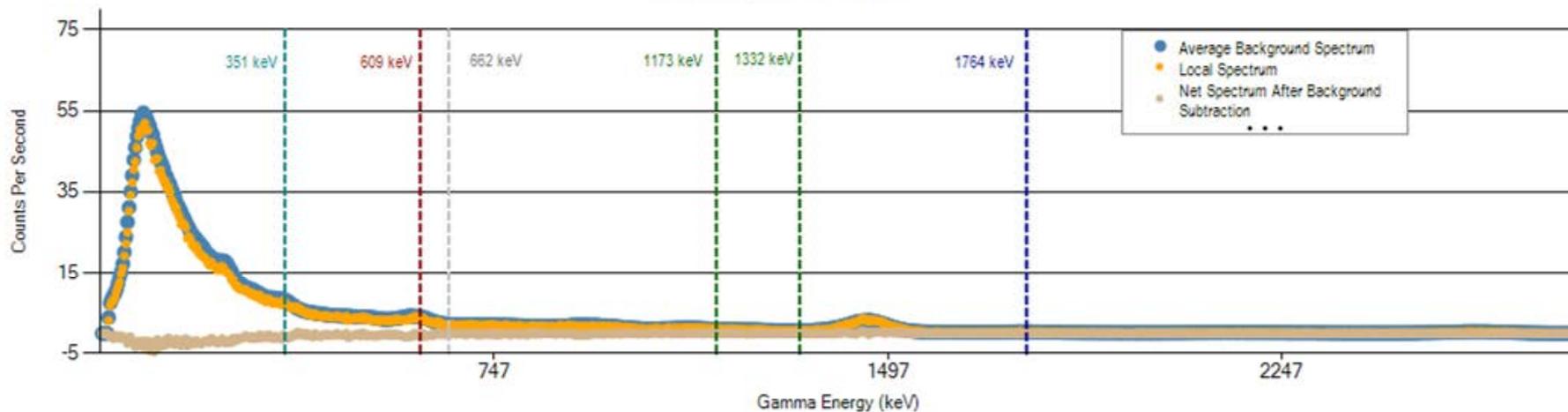


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 9 (cps)	762	118	17	18	130	120	95	151	84	3239
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 10

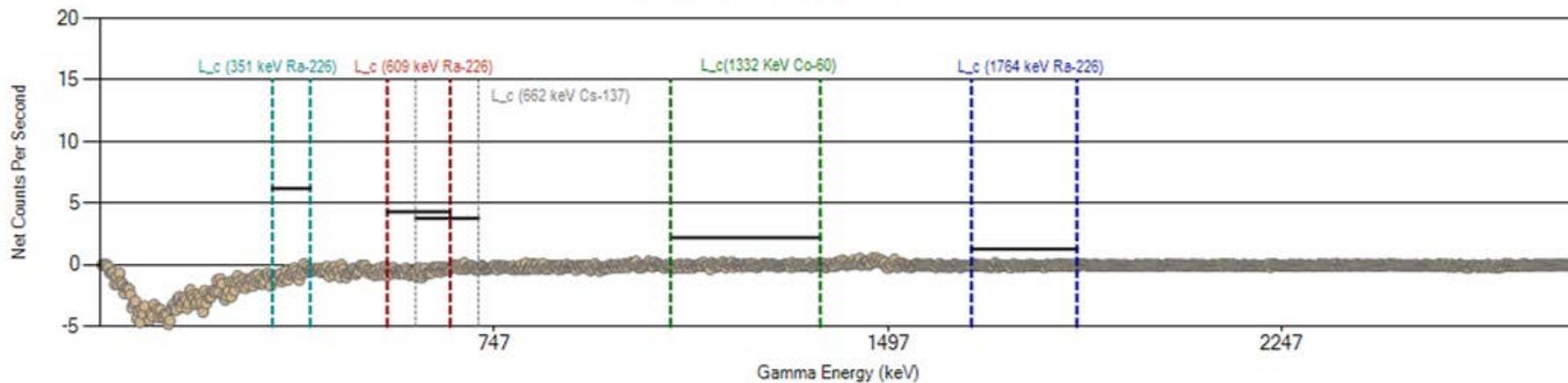


Gamma Spectra at Location 10

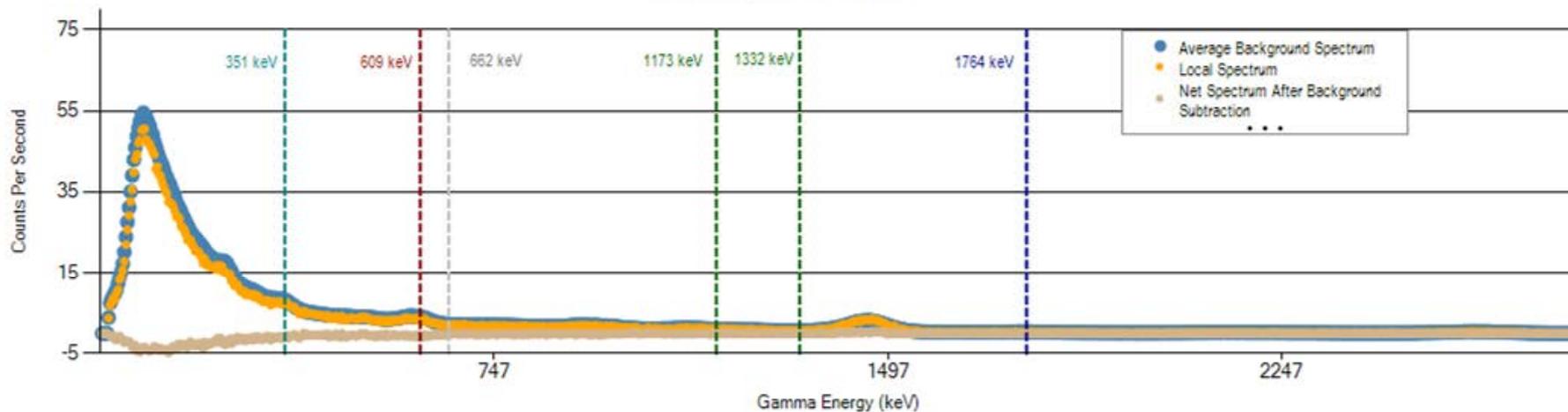


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 10 (cps)	795	121	16	19	135	125	98	159	89	3347
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 11

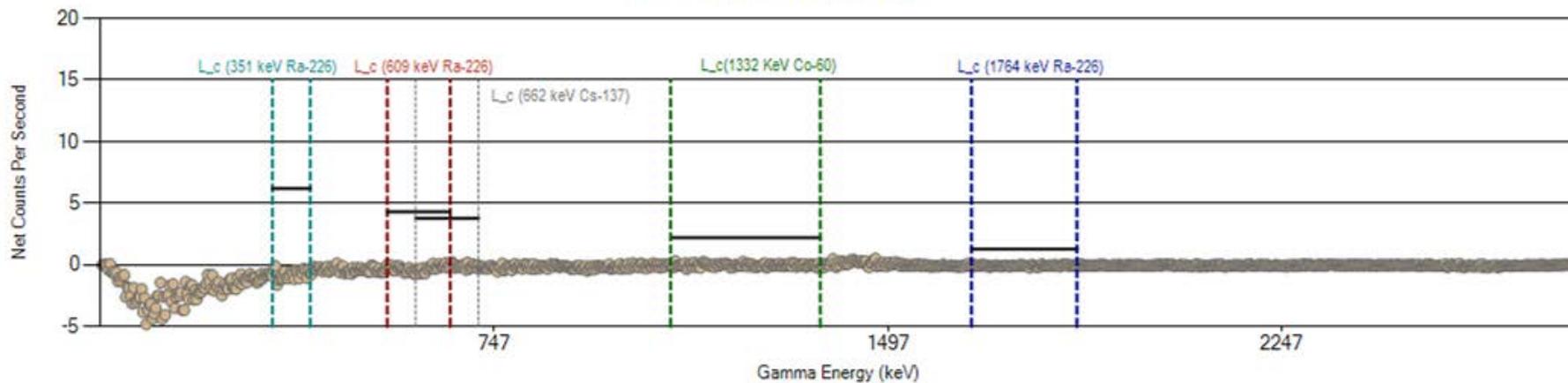


Gamma Spectra at Location 11

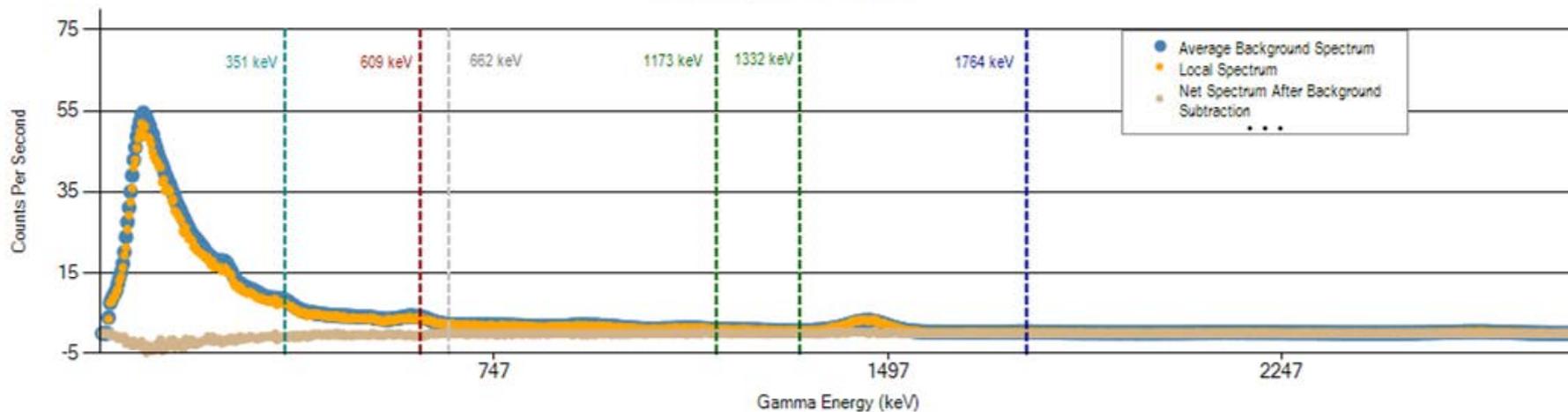


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 11 (cps)	779	121	17	19	132	120	94	156	86	3258
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 12

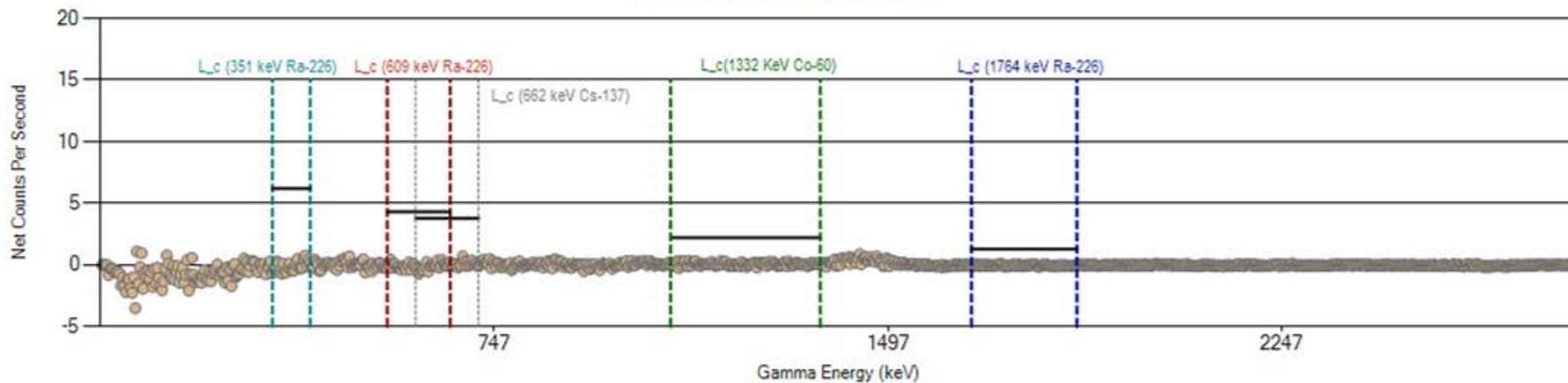


Gamma Spectra at Location 12

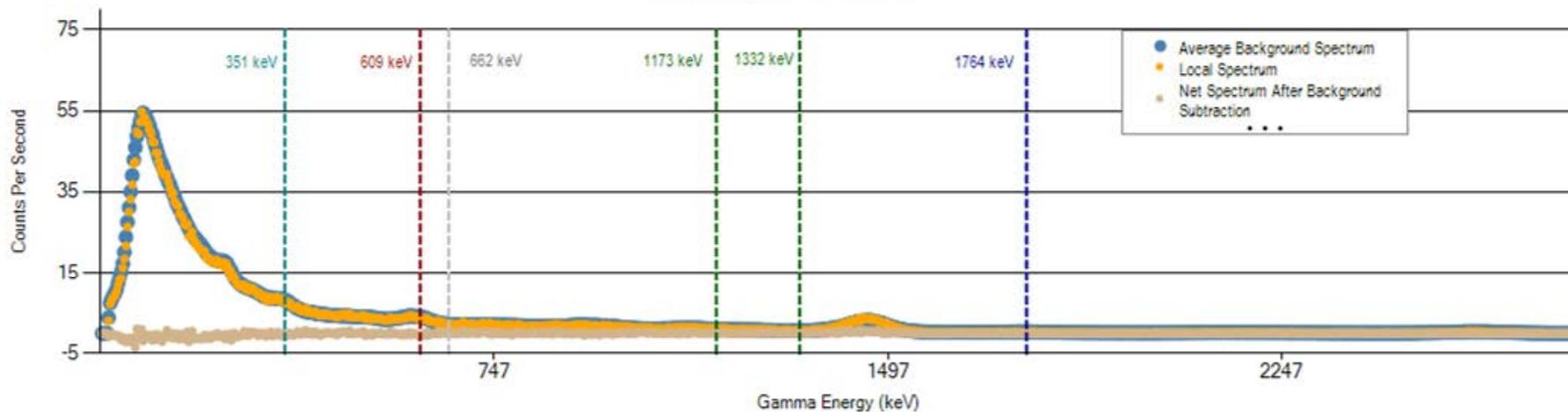


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 12 (cps)	793	121	17	19	137	128	100	155	86	3327
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 13

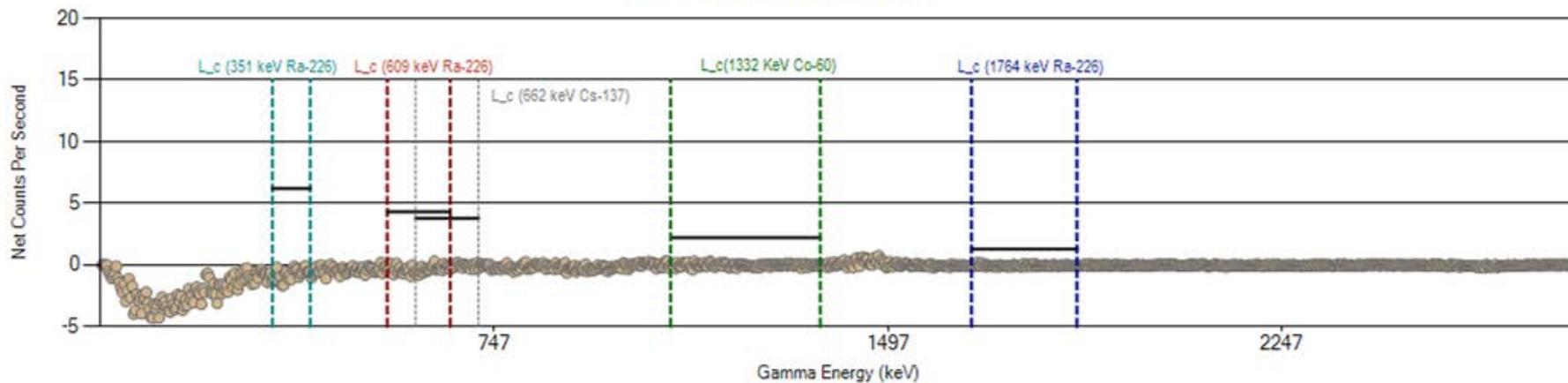


Gamma Spectra at Location 13

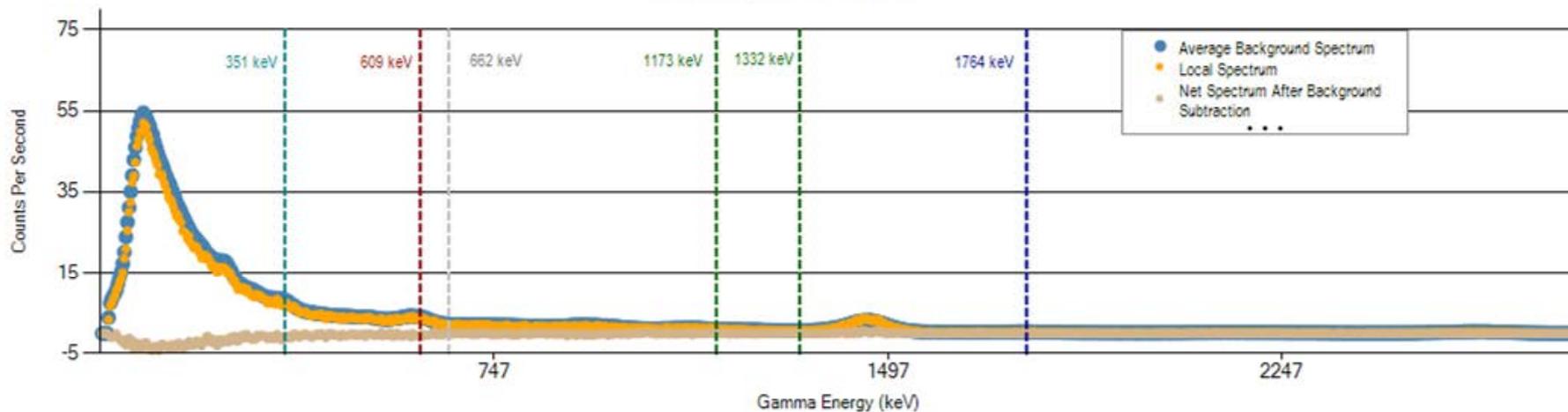


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 13 (cps)	867	130	18	20	151	136	107	172	95	3549
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

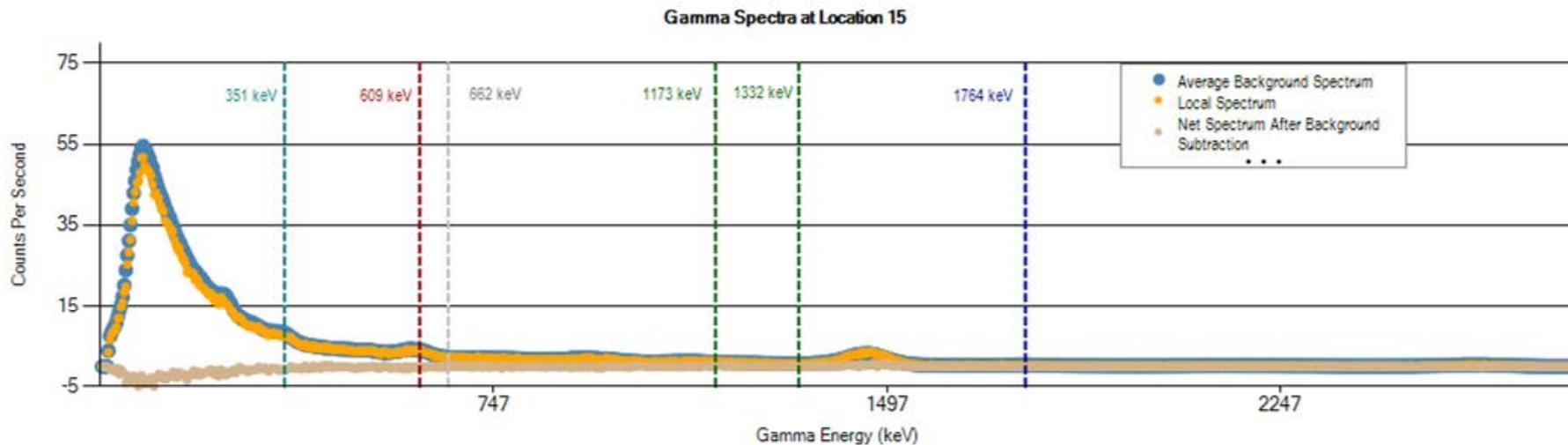
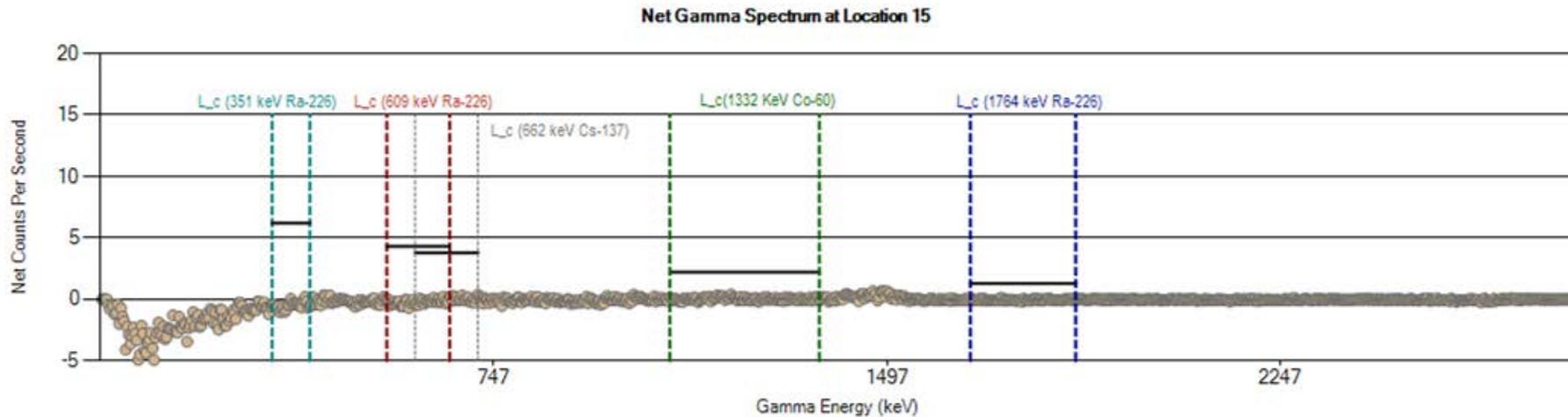
Net Gamma Spectrum at Location 14



Gamma Spectra at Location 14

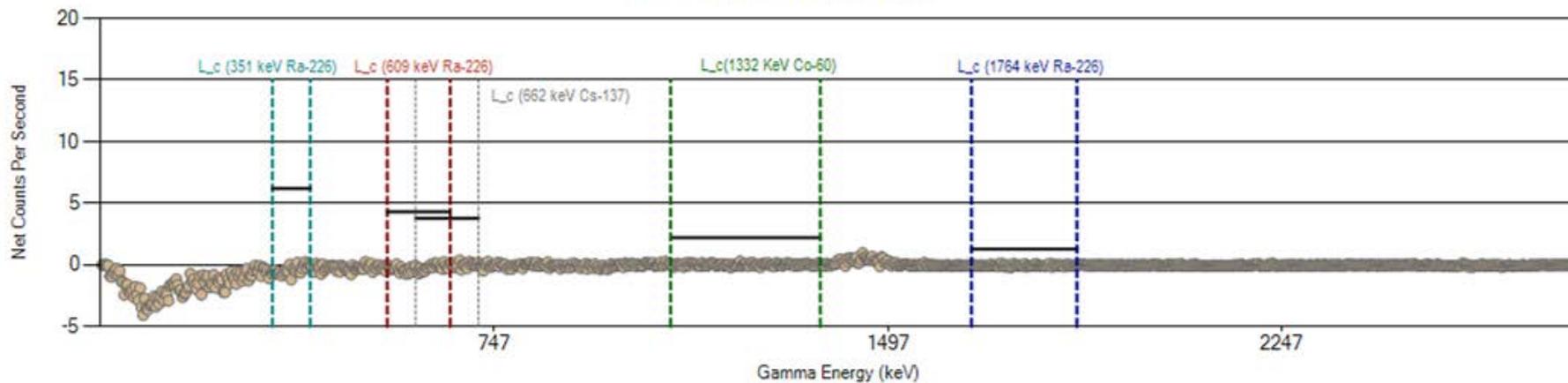


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 14 (cps)	797	122	17	19	138	126	100	156	87	3318
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

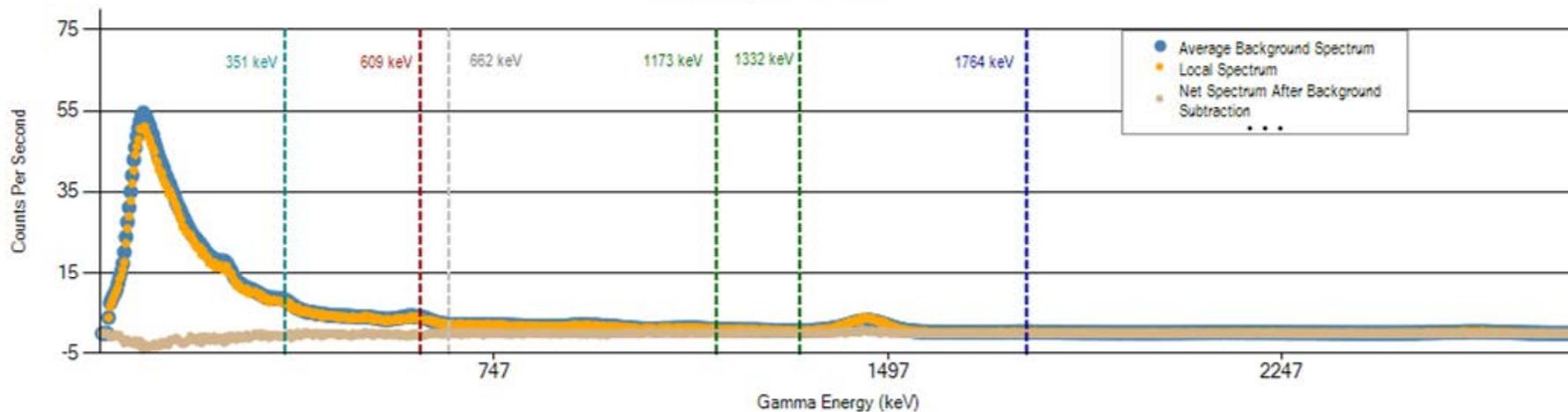


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 15 (cps)	837	127	18	20	143	132	105	162	92	3389
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 16

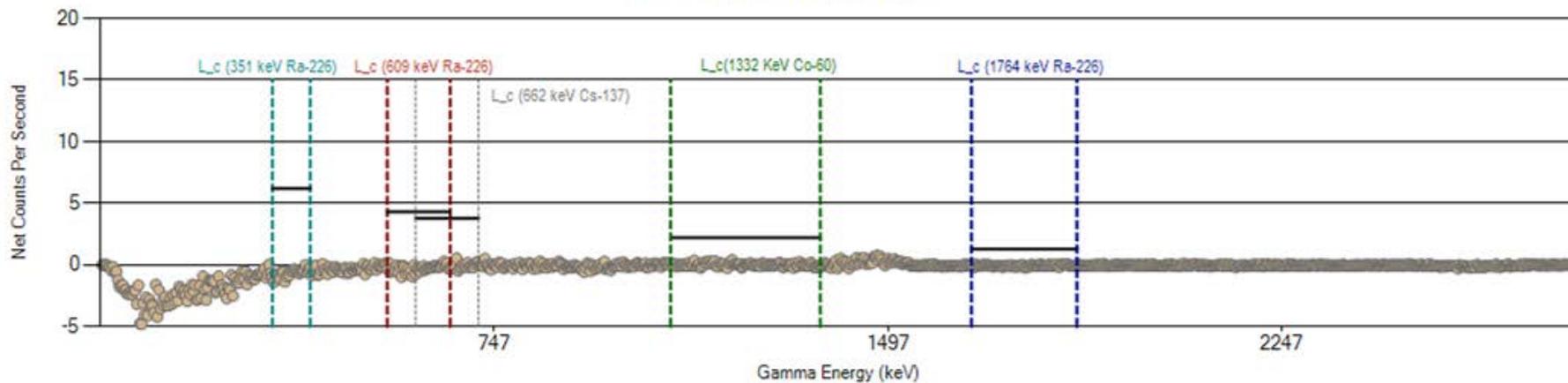


Gamma Spectra at Location 16

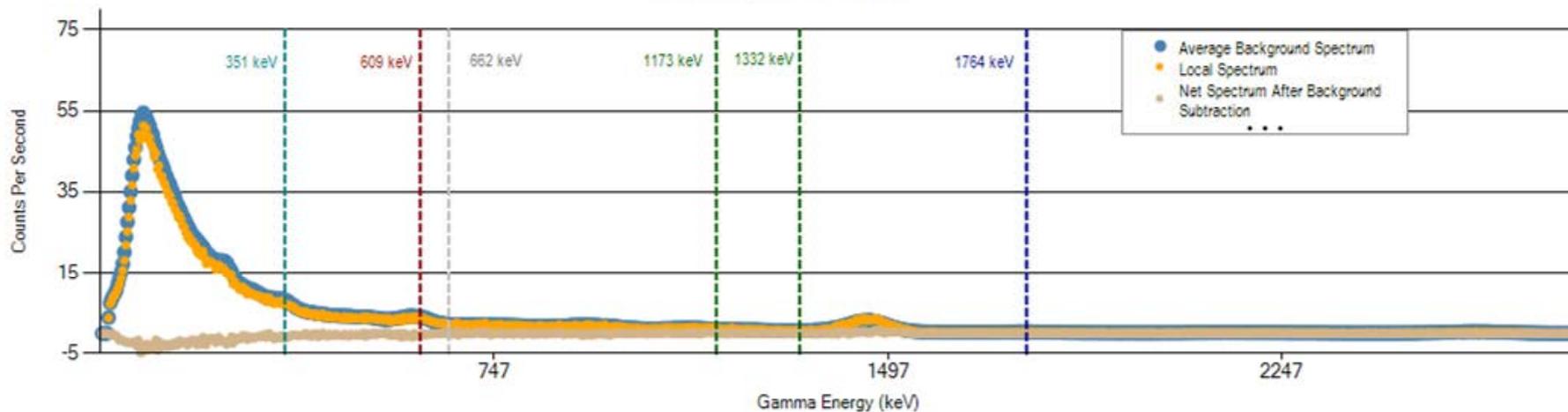


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 16 (cps)	832	128	18	20	142	130	103	165	91	3417
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

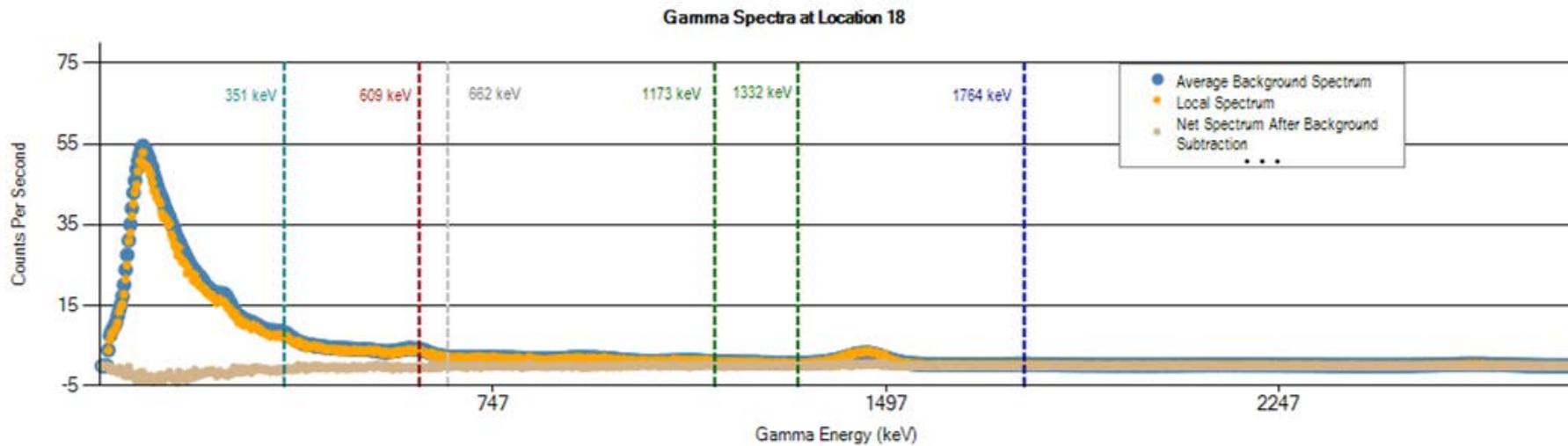
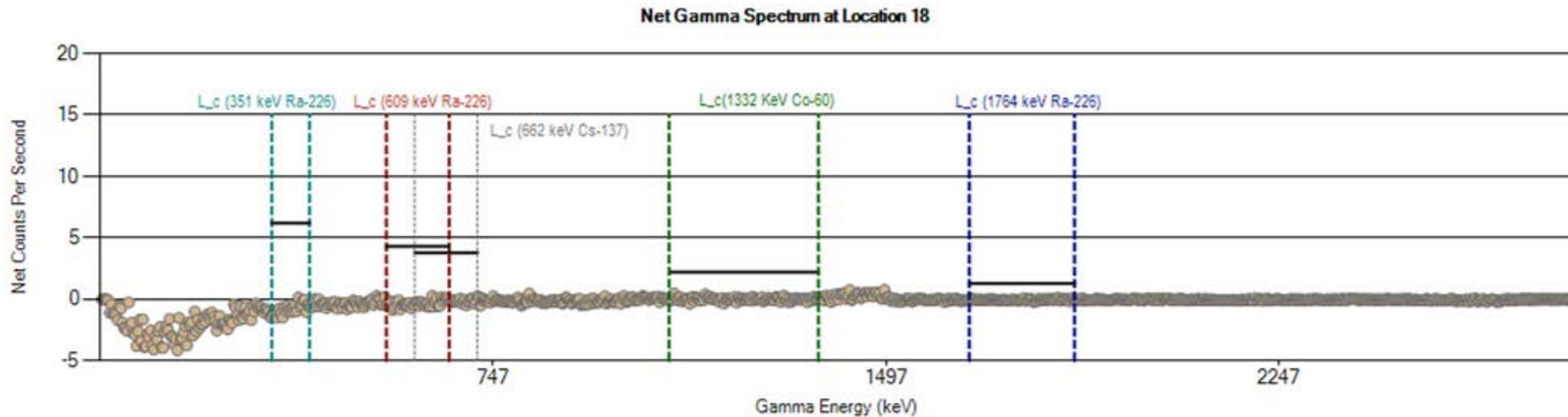
Net Gamma Spectrum at Location 17



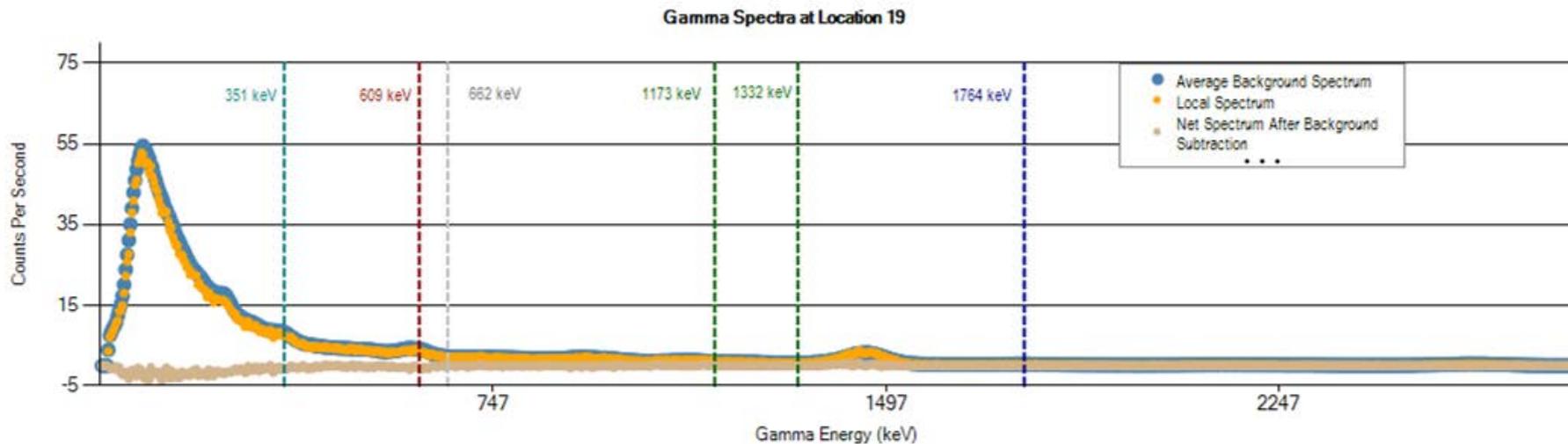
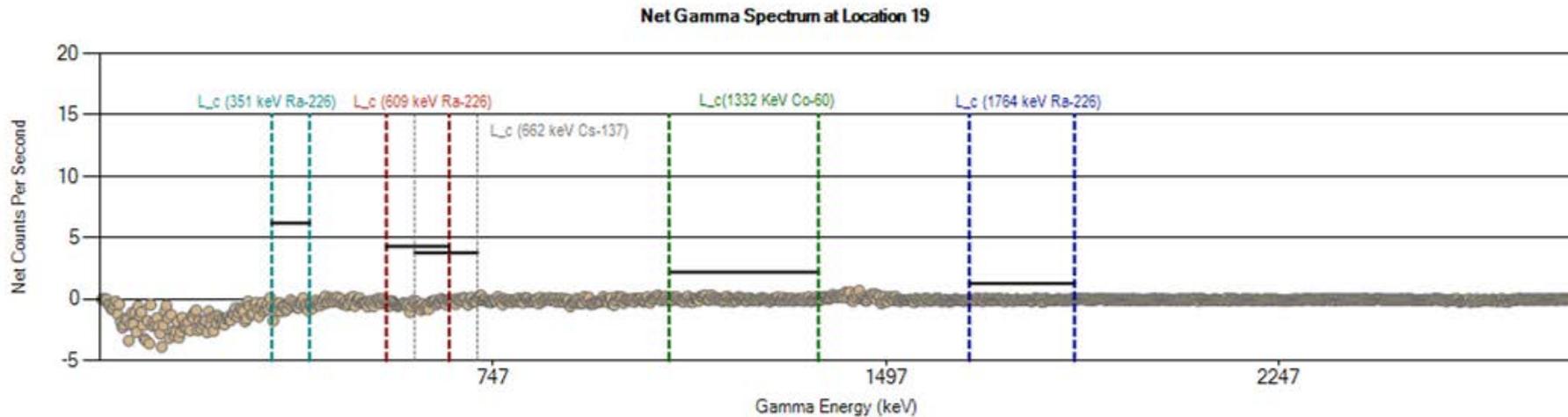
Gamma Spectra at Location 17



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 17 (cps)	817	126	17	18	140	129	103	157	90	3354
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

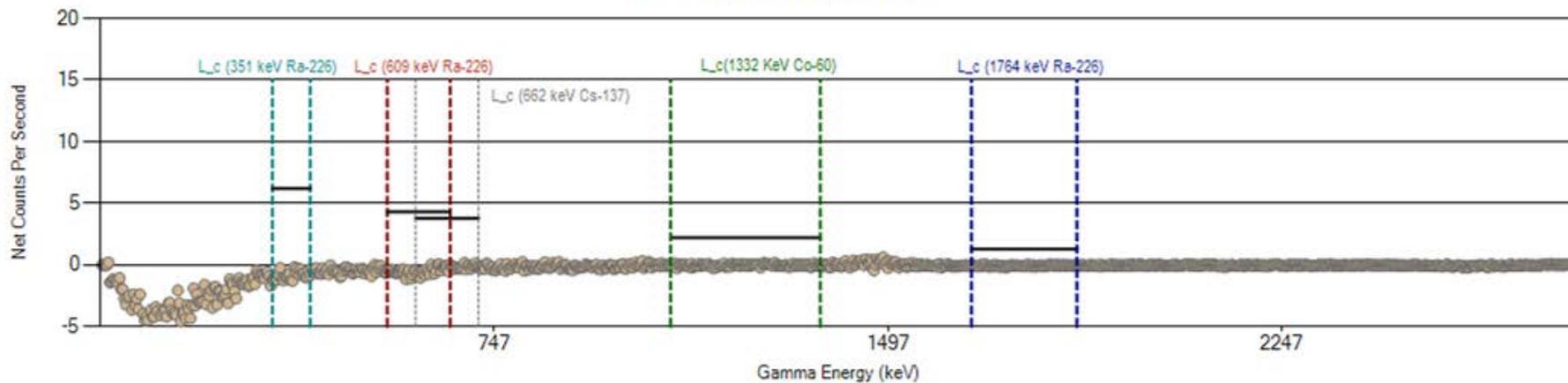


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 18 (cps)	810	126	18	19	138	127	100	156	90	3345
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

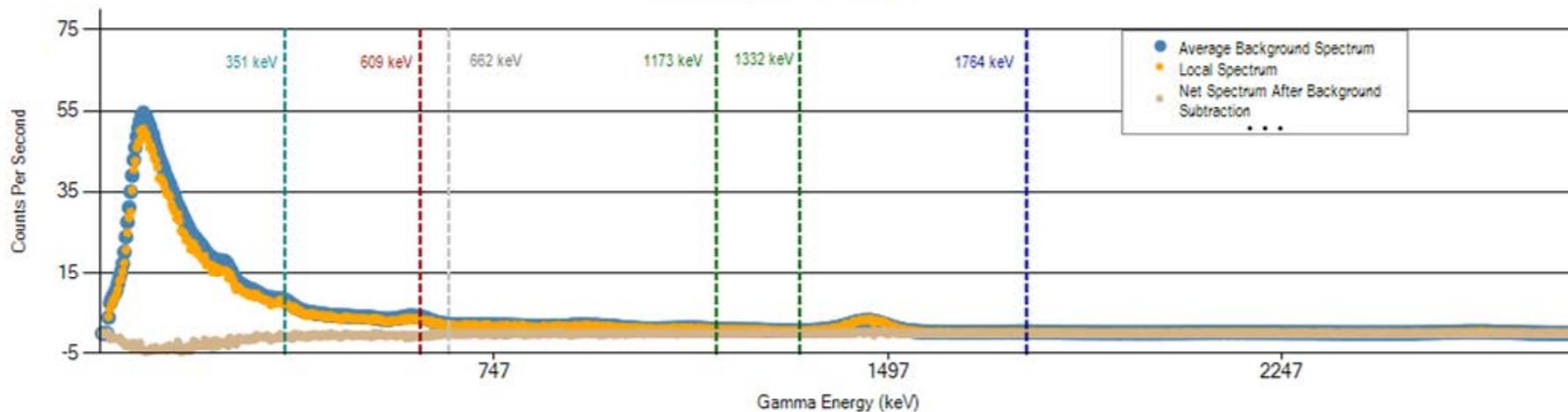


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 19 (cps)	813	121	17	19	142	125	99	160	88	3390
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

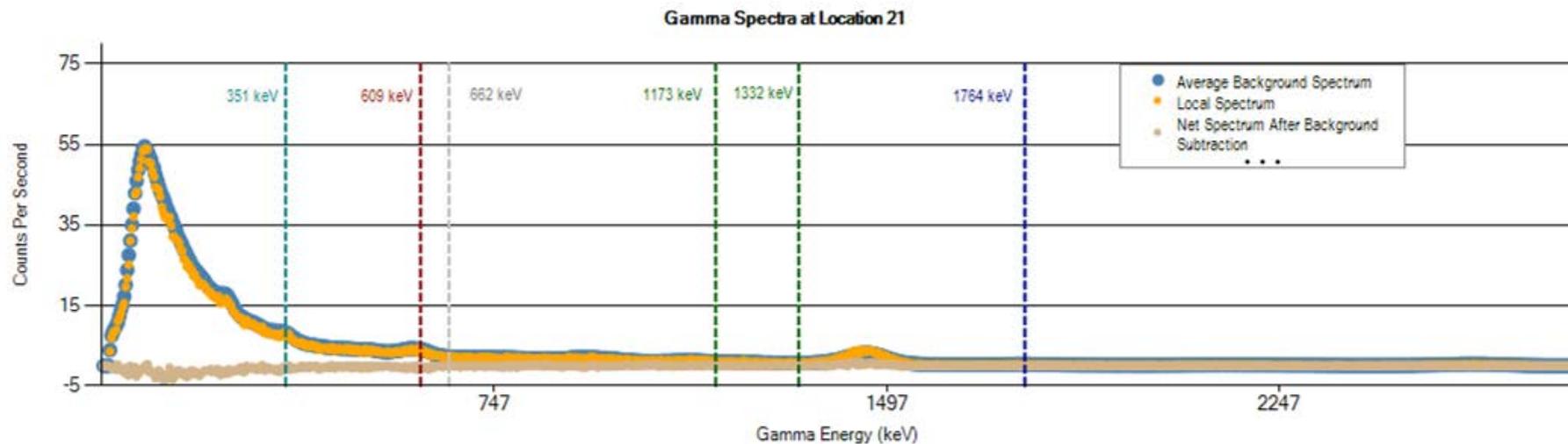
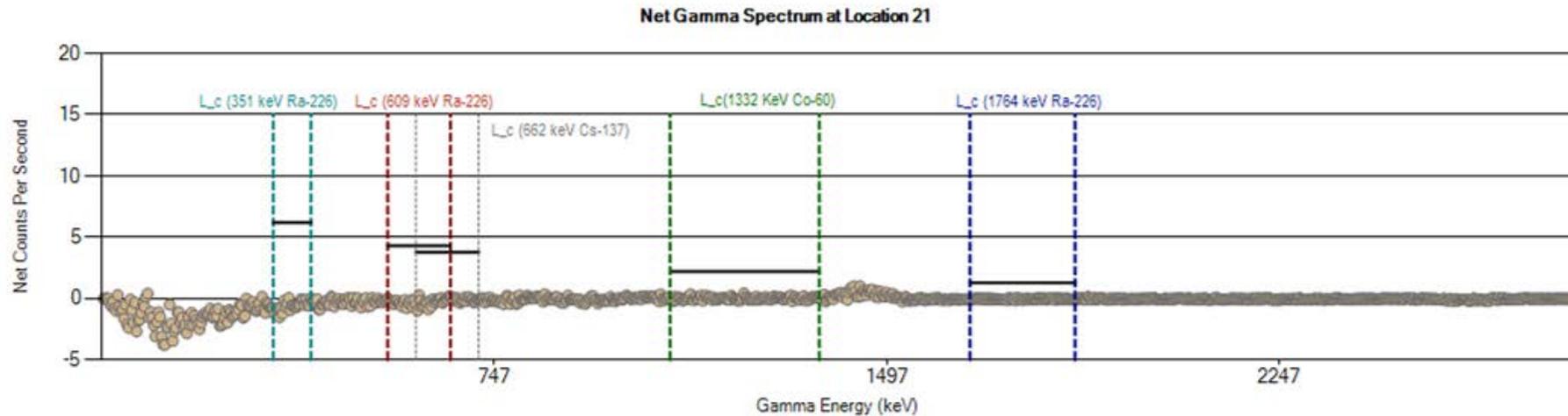
Net Gamma Spectrum at Location 20



Gamma Spectra at Location 20

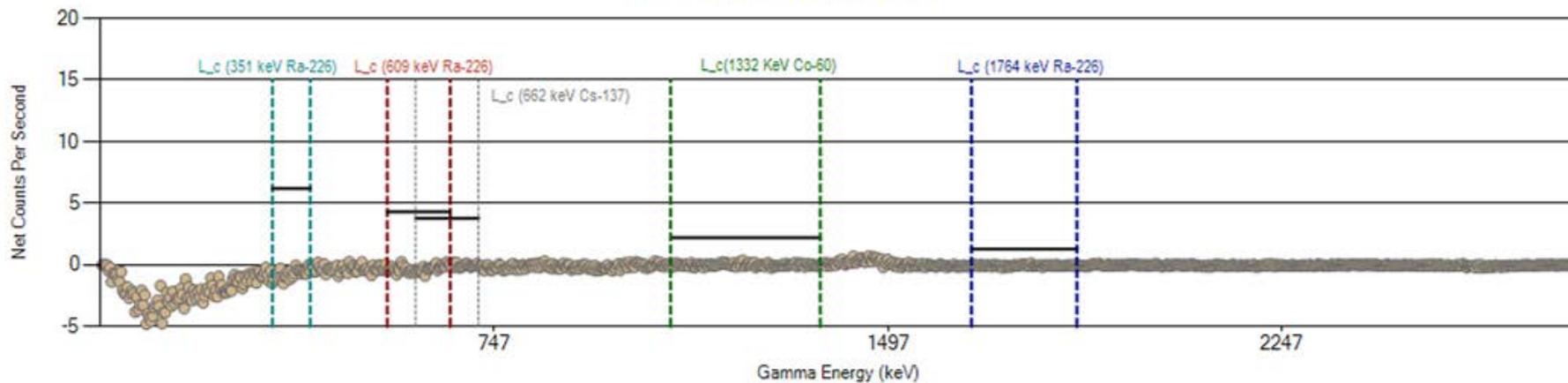


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 20 (cps)	782	119	16	19	133	121	95	154	86	3249
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

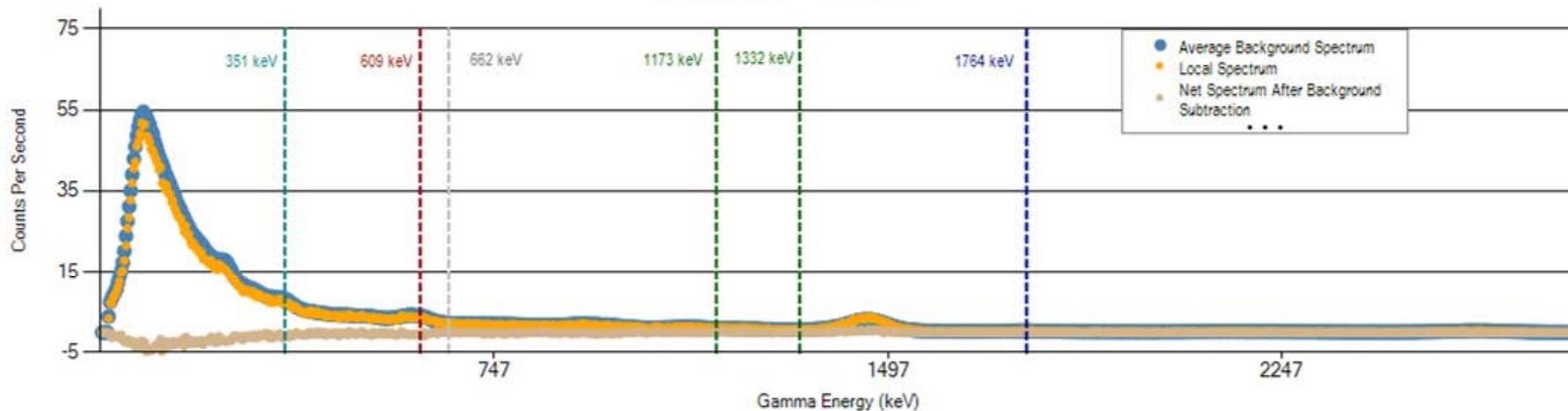


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 21 (cps)	827	130	18	19	141	129	100	160	91	3430
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 22

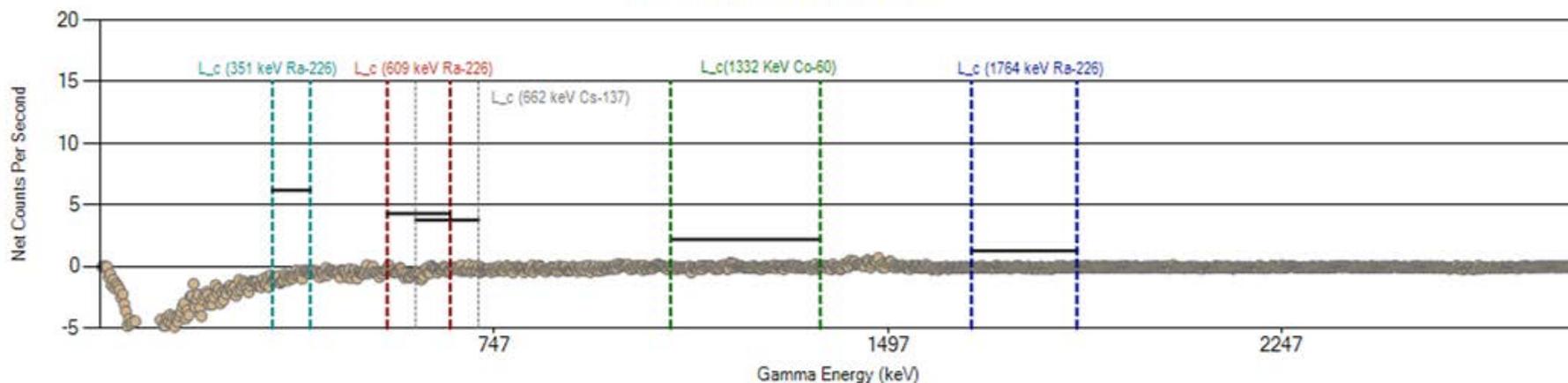


Gamma Spectra at Location 22

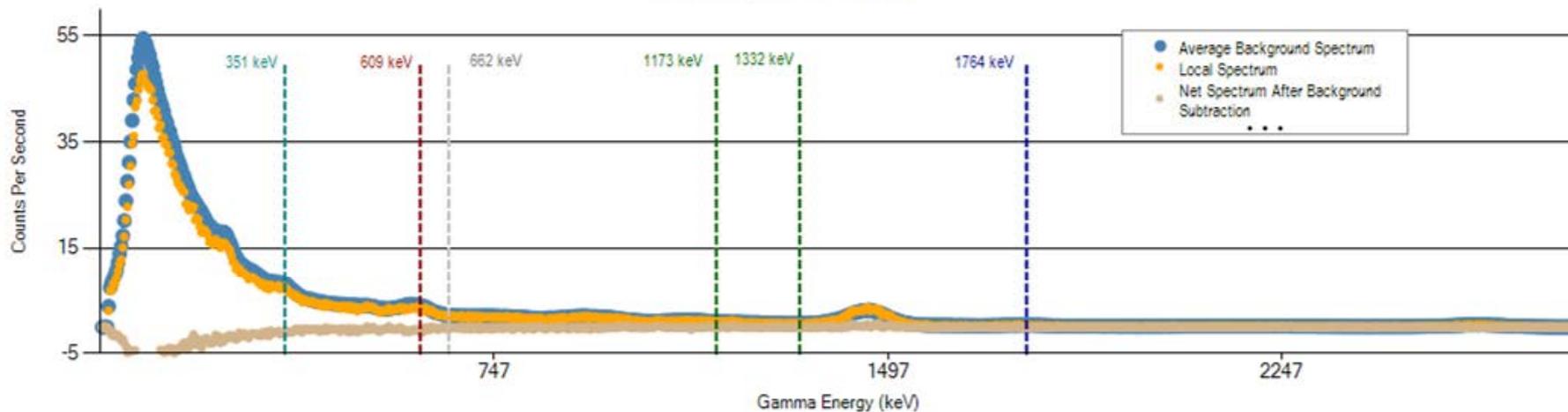


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 22 (cps)	808	126	17	18	140	128	102	158	89	3331
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 23



Gamma Spectra at Location 23

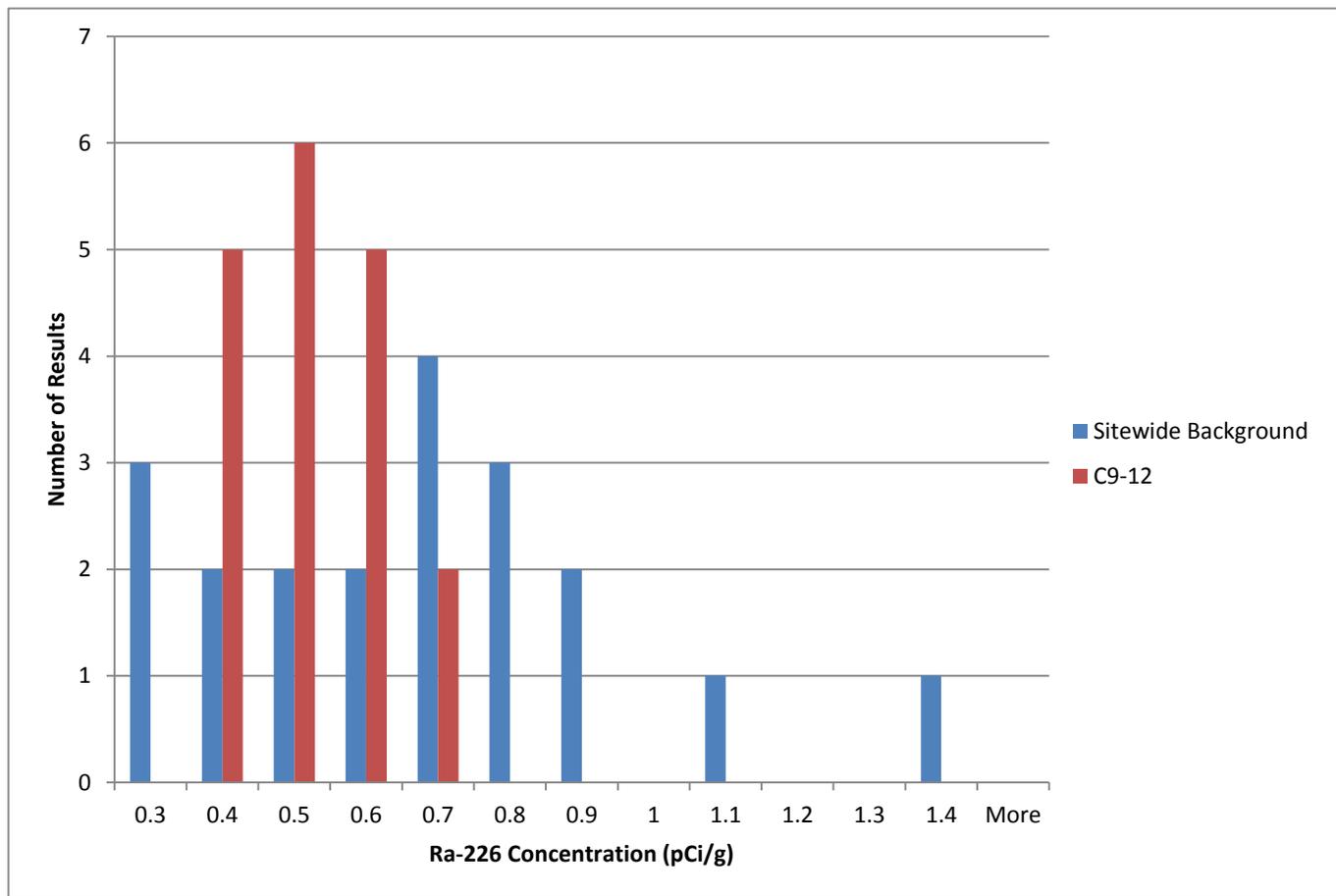


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 23 (cps)	786	122	17	19	136	124	96	156	85	3197
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Histogram, RSY C9 (Use 12) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

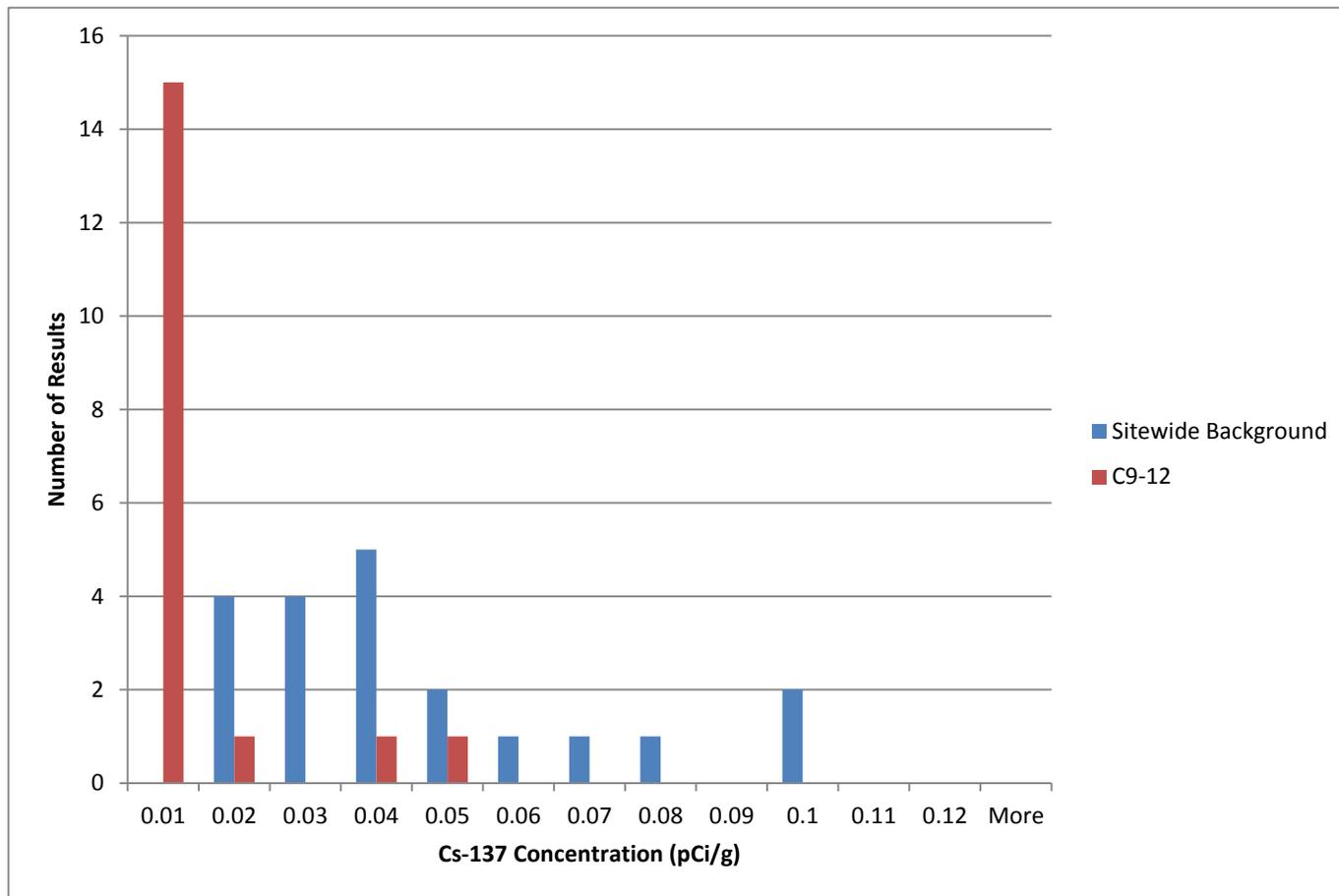
C9-12	
<i>Bin</i>	<i>Frequency</i>
0.3	0
0.4	5
0.5	6
0.6	5
0.7	2
0.8	0
0.9	0
1	0
1.1	0
1.2	0
1.3	0
1.4	0
More	0



Histogram, RSY C9 (Use 12) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

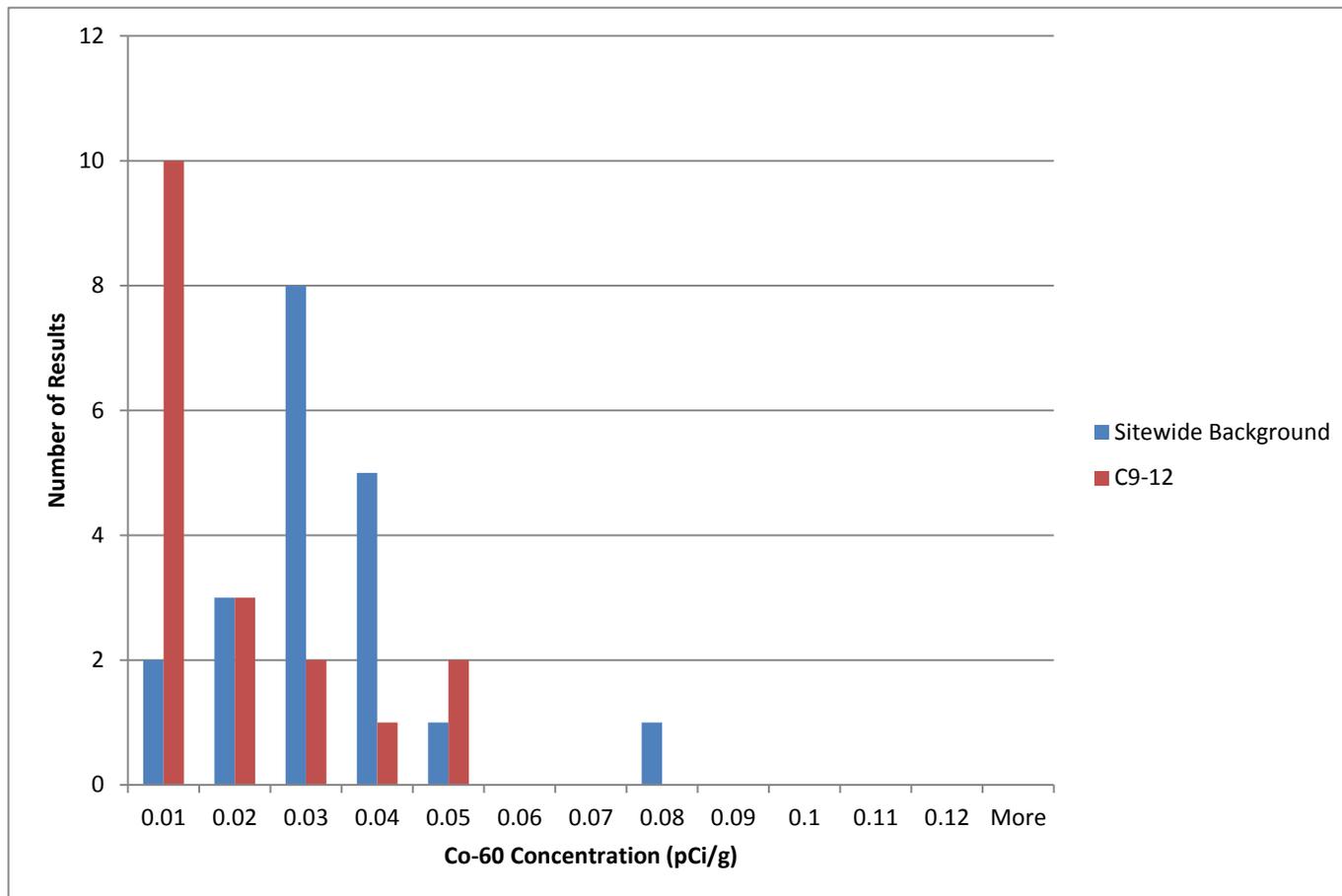
C9-12	
<i>Bin</i>	<i>Frequency</i>
0.01	15
0.02	1
0.03	0
0.04	1
0.05	1
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



Histogram, RSY C9 (Use 12) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.01	2
0.02	3
0.03	8
0.04	5
0.05	1
0.06	0
0.07	0
0.08	1
0.09	0
0.1	0
0.11	0
0.12	0
More	0

C9-12	
<i>Bin</i>	<i>Frequency</i>
0.01	10
0.02	3
0.03	2
0.04	1
0.05	2
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-29415-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:
8/7/2018 8:59:22 AM

Rhonda Ridenhower, Manager of Project Management
(314)298-8566
rhonda.ridenhower@testamericainc.com

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www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Job ID: 160-29415-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-29415-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Job ID: 160-29415-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 07/10/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

TOTAL BETA STRONTIUM (GFPC)

Samples PE2-RSYC9-U12-S001 (160-29415-1) and PE2-RSYC9-U12-S011 (160-29415-11) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 07/10/2018, prepared on 07/16/2018 and analyzed on 08/02/2018.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYC9-U12-S001 (160-29415-1) and PE2-RSYC9-U12-S011 (160-29415-11). The samples contained rocks of varying sizes.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYC9-U12-S001 (160-29415-1), PE2-RSYC9-U12-S002 (160-29415-2), PE2-RSYC9-U12-S003 (160-29415-3), PE2-RSYC9-U12-S004 (160-29415-4), PE2-RSYC9-U12-S005 (160-29415-5), PE2-RSYC9-U12-S006 (160-29415-6), PE2-RSYC9-U12-S007 (160-29415-7), PE2-RSYC9-U12-S008 (160-29415-8), PE2-RSYC9-U12-S009 (160-29415-9), PE2-RSYC9-U12-S010 (160-29415-10), PE2-RSYC9-U12-S011 (160-29415-11), PE2-RSYC9-U12-S012 (160-29415-12), PE2-RSYC9-U12-S013 (160-29415-13), PE2-RSYC9-U12-S014 (160-29415-14), PE2-RSYC9-U12-S015 (160-29415-15), PE2-RSYC9-U12-S016 (160-29415-16), PE2-RSYC9-U12-S017 (160-29415-17) and PE2-RSYC9-U12-S018 (160-29415-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 07/10/2018, prepared on 07/11/2018 and analyzed on 08/02/2018 and 08/03/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

PE2-RSYC9-U12-S001 (160-29415-1), PE2-RSYC9-U12-S006 (160-29415-6), PE2-RSYC9-U12-S009 (160-29415-9), PE2-RSYC9-U12-S011 (160-29415-11) and PE2-RSYC9-U12-S018 (160-29415-18)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

CHAIN OF CUSTODY

Project Number: 500506

CTO-013 RSYC9 USE 12 Shoreline
Revetment Spoils Systematic

Project Name: HPNS - Parcel E-2

Purchase Order #: 202296

Waybill Number: 12664545 137119 1345

Lab Destination: TestAmerica (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63045

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Project Manager: Nels Johnson
(Name & phone #)

Send Report To: Eddie Kalombo
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA, 94520

Sampler's Name(s): JOAOVIN RAMATE

Sample ID Number	Sample Description	Collection Information		Matrix	# of containers	Preservative (water)	Preservative (soil)	Container Type	Dose Rate μ R/Hr
		Date	Time						
PE2-RSYC9-U12-S001	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0824	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S002	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0828	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S003	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0831	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S004	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0835	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S005	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0839	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S006	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0842	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S007	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0846	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S008	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0850	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S009	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0854	SO	1	16 oz. plastic jar			5
PE2-RSYC9-U12-S010	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0858	SO	1	16 oz. plastic jar			5

Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project level of 0.331 pCi/g.

Level of QC Required:

24-hr

Standard TAT - 10-day

3-day

10-day

Project Specific:

Relinquished By: JOAOVIN RAMATE

Date: 7/5/2018

Time: 1100

Received By: EDDIE KALOMBO

Date: 7-5-18

Time: 1100

Relinquished By: EDDIE KALOMBO

Date: 7-9-18

Time: 1600

Received By: [Signature]

Date: 7/9/18

Time: 0858

Relinquished By:

Date:

Time:

Received By:

Date:

Time:

Relinquished By:

Date:

Time:

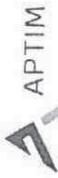
Received By:

Date:

Time:

Analyses Requested		Gamma Spec (EPA 191.1 M) - (7 day in-growth preliminary results and full 21 day in-growth for full gamma results)	Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)	Dose Rate μ R/Hr
		N/A	N/A	N/A	
		X	X	X	5
		X			5
		X			5
		X			5
		X			5
		X			5
		X			5
		X			5
		X			5
		X			5
		X			5
		X			5





APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

CHAIN OF CUSTODY

Ref. Document # PE2-RSYC9_USE12_SH_SAND#552

Page 2 of 2

Project Number: 500506

CTO-013 RSYC9 USE 12 Shoreline
Revetment Spoils Systematic

Project Name:

Project Location: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.1.10

Waybill Number: 126615451392191345

Lab Destination: TestAmerica (St. Louis Lab)

13715 Rider Trail North

Earth City, MO 63045

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Project Manager: Nels Johnson

(Name & phone #)

Send Report To: Eddie Kalombo

Phone/Fax Number: 415-987-0760

Address: 4005 Port Chicago Hwy

City: Concord, CA, 94520

Sampler's Name(s): Jessica Ramirez

Sample ID Number	Sample Description	Collection Information		Matrix	# of containers	Preservative (water)		Gamma Spec (EPA 191.1 M) - (7 day in-growth for preliminary results and full 21 day in-growth for full gamma results)	Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)	Analyses Requested	Dose Rate μ R/hr
		Date	Time			Method	Container Type					
PE2-RSYC9-U12-S011	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0902	G	SO 1	16 oz. plastic jar		X	X			5
PE2-RSYC9-U12-S012	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0926	G	SO 1	16 oz. plastic jar		X				5
PE2-RSYC9-U12-S013	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0910	G	SO 1	16 oz. plastic jar		X				5
PE2-RSYC9-U12-S014	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0914	G	SO 1	16 oz. plastic jar		X				5
PE2-RSYC9-U12-S015	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0918	G	SO 1	16 oz. plastic jar		X				5
PE2-RSYC9-U12-S016	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0922	G	SO 1	16 oz. plastic jar		X				5
PE2-RSYC9-U12-S017	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0926	G	SO 1	16 oz. plastic jar		X				5
PE2-RSYC9-U12-S018	Parcel E-2 RSYC9 USE 12 Systematic	7/5/18	0931	G	SO 1	16 oz. plastic jar		X				5

Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

7 days ingrown draft and follow with 21 days final.

Level QC Required: 24-hr 3-day 10-day

Standard TAT - 10-day

Relinquished By: Jessica Ramirez Date: 7/5/18 Time: 1100
 Relinquished By: Eddie Kalombo Date: 7.1.18 Time: 1600

Received By: Eddie Kalombo Date: 7.5.18 Time: 1100
 Received By: Michelle Allen Date: 7/10/18 Time: 0850

Method Codes: C = Composite G = Grab
 Matrix Codes: DW = Drinking Water SO = Soil
 GW = Ground Water SL = Sludge
 WW = Waste Water CP = Chip Samples
 A = Air ABS=Asbestos, PO=Pipe Opening



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29415-2

Login Number: 29415**List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
 None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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Sample Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29415-1	PE2-RSYC9-U12-S001	Solid	07/05/18 08:24	07/10/18 08:50
160-29415-2	PE2-RSYC9-U12-S002	Solid	07/05/18 08:28	07/10/18 08:50
160-29415-3	PE2-RSYC9-U12-S003	Solid	07/05/18 08:31	07/10/18 08:50
160-29415-4	PE2-RSYC9-U12-S004	Solid	07/05/18 08:35	07/10/18 08:50
160-29415-5	PE2-RSYC9-U12-S005	Solid	07/05/18 08:39	07/10/18 08:50
160-29415-6	PE2-RSYC9-U12-S006	Solid	07/05/18 08:42	07/10/18 08:50
160-29415-7	PE2-RSYC9-U12-S007	Solid	07/05/18 08:46	07/10/18 08:50
160-29415-8	PE2-RSYC9-U12-S008	Solid	07/05/18 08:50	07/10/18 08:50
160-29415-9	PE2-RSYC9-U12-S009	Solid	07/05/18 08:54	07/10/18 08:50
160-29415-10	PE2-RSYC9-U12-S010	Solid	07/05/18 08:58	07/10/18 08:50
160-29415-11	PE2-RSYC9-U12-S011	Solid	07/05/18 09:02	07/10/18 08:50
160-29415-12	PE2-RSYC9-U12-S012	Solid	07/05/18 09:06	07/10/18 08:50
160-29415-13	PE2-RSYC9-U12-S013	Solid	07/05/18 09:10	07/10/18 08:50
160-29415-14	PE2-RSYC9-U12-S014	Solid	07/05/18 09:14	07/10/18 08:50
160-29415-15	PE2-RSYC9-U12-S015	Solid	07/05/18 09:18	07/10/18 08:50
160-29415-16	PE2-RSYC9-U12-S016	Solid	07/05/18 09:22	07/10/18 08:50
160-29415-17	PE2-RSYC9-U12-S017	Solid	07/05/18 09:26	07/10/18 08:50
160-29415-18	PE2-RSYC9-U12-S018	Solid	07/05/18 09:31	07/10/18 08:50

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Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S001

Lab Sample ID: 160-29415-1

Date Collected: 07/05/18 08:24

Matrix: Solid

Date Received: 07/10/18 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.0212	U	0.0522	0.0522	0.331	0.0449	pCi/g	07/16/18 13:23	08/02/18 05:38	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	89.2		40 - 110					07/16/18 13:23	08/02/18 05:38	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.436		0.210	0.214		0.169	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Actinium-227	0.309	U	0.684	0.685		0.457	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Bismuth-212	0.000	U	0.836	0.836		0.964	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Bismuth-214	0.644		0.164	0.177		0.0505	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Cesium-137	-0.0142	U	0.0894	0.0894	0.0700	0.0745	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Cobalt-60	0.0112	U	0.0414	0.0414	0.200	0.0417	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Lead-210	0.294	U	0.975	0.976		0.732	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Lead-212	0.595		0.117	0.140		0.0510	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Lead-214	0.672		0.150	0.166		0.0597	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Potassium-40	11.3		1.91	2.23		0.334	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Protactinium-231	0.000	U	0.431	0.431		2.61	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Radium-226	0.644		0.164	0.177	0.700	0.0505	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Radium-228	0.436		0.210	0.214		0.169	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Thallium-208	0.196		0.0782	0.0808		0.0266	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Thorium-228	0.595		0.117	0.140		0.0510	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Thorium-232	0.436		0.210	0.214		0.169	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Thorium-234	0.772	U	1.16	1.16		0.788	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Uranium-235	0.286	U	0.254	0.256		0.341	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Uranium-238	0.772	U	1.16	1.16		0.788	pCi/g	07/11/18 18:35	08/02/18 22:40	1

Client Sample ID: PE2-RSYC9-U12-S002

Lab Sample ID: 160-29415-2

Date Collected: 07/05/18 08:28

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.630		0.115	0.132		0.0408	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Actinium-227	-0.326	U	0.784	0.785		0.633	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Bismuth-212	0.374	U	0.644	0.645		0.497	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Bismuth-214	0.506		0.113	0.125		0.0389	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Cesium-137	0.0194	U	0.0512	0.0512	0.0700	0.0404	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Cobalt-60	0.0205	U	0.0495	0.0495	0.200	0.0232	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Lead-210	-0.754	U	1.40	1.40		1.11	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Lead-212	0.536		0.106	0.127		0.0421	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Lead-214	0.526		0.0972	0.112		0.0177	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Potassium-40	12.1		1.45	1.90		0.260	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Protactinium-231	0.749	U	1.80	1.80		1.97	pCi/g	07/11/18 18:35	08/02/18 23:15	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S002

Lab Sample ID: 160-29415-2

Date Collected: 07/05/18 08:28

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.506		0.113	0.125	0.700	0.0389	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Radium-228	0.630		0.115	0.132		0.0408	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Thallium-208	0.171		0.0600	0.0626		0.0221	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Thorium-228	0.536		0.106	0.127		0.0421	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Thorium-232	0.630		0.115	0.132		0.0408	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Thorium-234	0.000	U	0.692	0.692		1.12	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Uranium-235	0.139	U	0.384	0.384		0.339	pCi/g	07/11/18 18:35	08/02/18 23:15	1
Uranium-238	0.000	U	0.692	0.692		1.12	pCi/g	07/11/18 18:35	08/02/18 23:15	1

Client Sample ID: PE2-RSYC9-U12-S003

Lab Sample ID: 160-29415-3

Date Collected: 07/05/18 08:31

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.632		0.193	0.203		0.0333	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Actinium-227	0.282	U	0.660	0.660		0.444	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Bismuth-212	0.205	U	0.703	0.703		0.556	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Bismuth-214	0.495		0.125	0.135		0.0423	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Cesium-137	-0.0496	U	0.0875	0.0877	0.0700	0.0685	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Cobalt-60	0.0141	U	0.0541	0.0541	0.200	0.0310	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Lead-210	-0.515	U	1.59	1.59		1.14	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Lead-212	0.529		0.106	0.126		0.0530	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Lead-214	0.586		0.135	0.148		0.0555	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Potassium-40	12.5		1.72	2.14		0.252	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Protactinium-231	0.000	U	0.479	0.479		2.16	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Radium-226	0.495		0.125	0.135	0.700	0.0423	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Radium-228	0.632		0.193	0.203		0.0333	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Thallium-208	0.199		0.0613	0.0647		0.0201	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Thorium-228	0.529		0.106	0.126		0.0530	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Thorium-232	0.632		0.193	0.203		0.0333	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Thorium-234	0.964		1.16	1.16		0.744	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Uranium-235	-0.180	U	0.272	0.272		0.322	pCi/g	07/11/18 18:35	08/02/18 23:16	1
Uranium-238	0.964		1.16	1.16		0.744	pCi/g	07/11/18 18:35	08/02/18 23:16	1

Client Sample ID: PE2-RSYC9-U12-S004

Lab Sample ID: 160-29415-4

Date Collected: 07/05/18 08:35

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.441		0.275	0.279		0.116	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Actinium-227	-0.291	U	0.871	0.872		0.705	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Bismuth-212	-0.350	U	0.994	0.995		0.790	pCi/g	07/11/18 18:35	08/02/18 23:17	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S004

Lab Sample ID: 160-29415-4

Date Collected: 07/05/18 08:35

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.517		0.131	0.142		0.0399	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Cesium-137	-0.0468	U	0.0808	0.0810	0.0700	0.0626	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Cobalt-60	0.00376	U	0.0688	0.0688	0.200	0.0485	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Lead-210	0.114	U	1.62	1.62		1.32	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Lead-212	0.467		0.104	0.120		0.0520	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Lead-214	0.548		0.114	0.127		0.0424	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Potassium-40	11.2		1.73	2.07		0.240	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Protactinium-231	-0.989	U	3.22	3.22		2.62	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Radium-226	0.517		0.131	0.142	0.700	0.0399	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Radium-228	0.441		0.275	0.279		0.116	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Thallium-208	0.243		0.0752	0.0793		0.0240	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Thorium-228	0.467		0.104	0.120		0.0520	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Thorium-232	0.441		0.275	0.279		0.116	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Thorium-234	0.334	U	1.48	1.48		1.20	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Uranium-235	-0.228	U	0.439	0.439		0.485	pCi/g	07/11/18 18:35	08/02/18 23:17	1
Uranium-238	0.334	U	1.48	1.48		1.20	pCi/g	07/11/18 18:35	08/02/18 23:17	1

Client Sample ID: PE2-RSYC9-U12-S005

Lab Sample ID: 160-29415-5

Date Collected: 07/05/18 08:39

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.625		0.224	0.233		0.0900	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Actinium-227	0.110	U	0.427	0.427		0.495	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Bismuth-212	0.000	U	0.674	0.674		0.689	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Bismuth-214	0.632		0.147	0.161		0.0531	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Cesium-137	-0.0459	U	0.0847	0.0849	0.0700	0.0611	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Cobalt-60	-0.0321	U	0.0758	0.0759	0.200	0.0367	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Lead-210	0.635	U	1.15	1.15		0.820	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Lead-212	0.661		0.109	0.139		0.0487	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Lead-214	0.677		0.144	0.160		0.0546	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Potassium-40	12.1		1.58	2.01		0.319	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Protactinium-231	0.000	U	0.690	0.690		2.03	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Radium-226	0.632		0.147	0.161	0.700	0.0531	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Radium-228	0.625		0.224	0.233		0.0900	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Thallium-208	0.235		0.0618	0.0665		0.0212	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Thorium-228	0.661		0.109	0.139		0.0487	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Thorium-232	0.625		0.224	0.233		0.0900	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Thorium-234	-0.889	U	1.66	1.66		1.39	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Uranium-235	0.00808	U	0.0366	0.0366		0.281	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Uranium-238	-0.889	U	1.66	1.66		1.39	pCi/g	07/11/18 18:35	08/02/18 23:18	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S006

Lab Sample ID: 160-29415-6

Date Collected: 07/05/18 08:42

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.750		0.226	0.239		0.0468	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Actinium-227	0.528	U	1.18	1.18		0.947	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Bismuth-212	-0.457	U	1.13	1.13		0.887	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Bismuth-214	0.693		0.180	0.194		0.0545	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Cesium-137	0.0547	U	0.0965	0.0967	0.0700	0.0743	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Cobalt-60	0.0544		0.0411	0.0415	0.200	0.0181	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Lead-210	-1.53	U	2.94	2.95		2.48	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Lead-212	0.867		0.149	0.174		0.0599	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Lead-214	0.756		0.197	0.212		0.0764	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Potassium-40	12.4		2.07	2.42		0.520	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Protactinium-231	-1.40	U	4.73	4.73		3.85	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Radium-226	0.693		0.180	0.194	0.700	0.0545	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Radium-228	0.750		0.226	0.239		0.0468	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Thallium-208	0.244		0.0833	0.0869		0.0274	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Thorium-228	0.867		0.149	0.174		0.0599	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Thorium-232	0.750		0.226	0.239		0.0468	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Thorium-234	0.937	U	0.793	0.800		1.02	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Uranium-235	-0.0985	U	0.198	0.198		0.611	pCi/g	07/11/18 18:35	08/02/18 23:18	1
Uranium-238	0.937	U	0.793	0.800		1.02	pCi/g	07/11/18 18:35	08/02/18 23:18	1

Client Sample ID: PE2-RSYC9-U12-S007

Lab Sample ID: 160-29415-7

Date Collected: 07/05/18 08:46

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.768		0.212	0.226		0.0341	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Actinium-227	0.295	U	0.932	0.933		0.755	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Bismuth-212	0.563	U	1.15	1.15		0.909	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Bismuth-214	0.598		0.153	0.165		0.0604	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Cesium-137	-0.0204	U	0.0786	0.0787	0.0700	0.0631	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Cobalt-60	0.0156	U	0.00778	0.00793	0.200	0.0542	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Lead-210	1.90		2.23	2.24		1.75	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Lead-212	0.449		0.111	0.121		0.0623	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Lead-214	0.522		0.137	0.147		0.0617	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Potassium-40	13.4		1.74	2.21		0.132	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Protactinium-231	-0.969	U	3.28	3.29		2.67	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Radium-226	0.598		0.153	0.165	0.700	0.0604	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Radium-228	0.768		0.212	0.226		0.0341	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Thallium-208	0.147		0.103	0.105		0.0499	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Thorium-228	0.449		0.111	0.121		0.0623	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Thorium-232	0.768		0.212	0.226		0.0341	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Thorium-234	-0.176	U	1.80	1.80		1.48	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Uranium-235	0.172	U	0.365	0.366		0.420	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Uranium-238	-0.176	U	1.80	1.80		1.48	pCi/g	07/11/18 18:35	08/03/18 07:02	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S008

Lab Sample ID: 160-29415-8

Date Collected: 07/05/18 08:50

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.465		0.186	0.192		0.117	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Actinium-227	-0.333	U	0.736	0.737		0.508	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Bismuth-212	-0.0162	U	0.997	0.997		0.550	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Bismuth-214	0.449		0.141	0.148		0.0569	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Cesium-137	-0.0367	U	0.0680	0.0681	0.0700	0.0528	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Cobalt-60	0.0282	U	0.0270	0.0271	0.200	0.0407	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-210	-0.0802	U	1.55	1.55		1.10	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-212	0.484		0.0950	0.114		0.0450	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-214	0.476		0.116	0.126		0.0747	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Potassium-40	9.83		1.48	1.79		0.236	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Protactinium-231	-0.785	U	2.62	2.62		2.13	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Radium-226	0.449		0.141	0.148	0.700	0.0569	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Radium-228	0.465		0.186	0.192		0.117	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thallium-208	0.162		0.0545	0.0571		0.0183	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-228	0.484		0.0950	0.114		0.0450	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-232	0.465		0.186	0.192		0.117	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-234	-0.0355	U	1.16	1.16		0.955	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Uranium-235	-0.151	U	0.451	0.451		0.262	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Uranium-238	-0.0355	U	1.16	1.16		0.955	pCi/g	07/11/18 18:35	08/03/18 07:01	1

Client Sample ID: PE2-RSYC9-U12-S009

Lab Sample ID: 160-29415-9

Date Collected: 07/05/18 08:54

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.503		0.187	0.194		0.0404	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Actinium-227	0.0354	U	0.0677	0.0678		0.729	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Bismuth-212	-0.291	U	0.997	0.998		0.795	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Bismuth-214	0.564		0.179	0.189		0.0733	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Cesium-137	0.0390	U	0.0933	0.0934	0.0700	0.0737	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Cobalt-60	-0.0947	U	0.131	0.131	0.200	0.0754	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-210	-0.656	U	1.68	1.68		1.41	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-212	0.528		0.118	0.137		0.0610	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-214	0.673		0.137	0.154		0.0462	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Potassium-40	12.2		1.89	2.27		0.264	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Protactinium-231	0.000	U	0.725	0.725		2.69	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Radium-226	0.564		0.179	0.189	0.700	0.0733	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Radium-228	0.503		0.187	0.194		0.0404	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thallium-208	0.252		0.0735	0.0780		0.0182	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-228	0.528		0.118	0.137		0.0610	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-232	0.503		0.187	0.194		0.0404	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-234	2.27		1.01	1.04		0.668	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Uranium-235	0.176	U	0.345	0.346		0.484	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Uranium-238	2.27		1.01	1.04		0.668	pCi/g	07/11/18 18:35	08/03/18 07:01	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S010

Lab Sample ID: 160-29415-10

Date Collected: 07/05/18 08:58

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.670		0.195	0.207		0.0489	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Actinium-227	0.0895	U	0.632	0.632		0.433	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Bismuth-212	0.347	U	0.611	0.612		0.463	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Bismuth-214	0.420		0.135	0.142		0.0565	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Cesium-137	-0.0150	U	0.0444	0.0445	0.0700	0.0544	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Cobalt-60	0.0547		0.0330	0.0334	0.200	0.0116	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Lead-210	1.66		1.61	1.62		0.989	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Lead-212	0.578		0.103	0.127		0.0452	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Lead-214	0.596		0.143	0.156		0.0586	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Potassium-40	10.9		1.53	1.90		0.329	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Protactinium-231	0.000	U	0.566	0.566		2.15	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Radium-226	0.420		0.135	0.142	0.700	0.0565	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Radium-228	0.670		0.195	0.207		0.0489	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Thallium-208	0.184		0.0625	0.0654		0.0267	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Thorium-228	0.578		0.103	0.127		0.0452	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Thorium-232	0.670		0.195	0.207		0.0489	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Thorium-234	0.470	U	0.617	0.619		0.789	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Uranium-235	0.0764	U	0.352	0.352		0.286	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Uranium-238	0.470	U	0.617	0.619		0.789	pCi/g	07/11/18 18:35	08/03/18 07:05	1

Client Sample ID: PE2-RSYC9-U12-S011

Lab Sample ID: 160-29415-11

Date Collected: 07/05/18 09:02

Matrix: Solid

Date Received: 07/10/18 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Total Beta Strontium	0.00686	U	0.0528	0.0528	0.331	0.0427	pCi/g	07/16/18 13:23	08/02/18 05:38	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	88.9		40 - 110					07/16/18 13:23	08/02/18 05:38	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.870		0.246	0.262		0.0433	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Actinium-227	-0.577	U	1.30	1.30		1.05	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Bismuth-212	-0.362	U	1.20	1.20		0.955	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Bismuth-214	0.675		0.227	0.237		0.0953	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Cesium-137	-0.0620	U	0.106	0.106	0.0700	0.0822	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Cobalt-60	-0.0647	U	0.146	0.146	0.200	0.0691	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-210	0.286	U	1.65	1.65		1.33	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-212	0.670		0.135	0.152		0.0643	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Lead-214	0.720		0.153	0.169		0.0485	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Potassium-40	13.9		2.10	2.53		0.481	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Protactinium-231	0.000	U	0.393	0.393		3.25	pCi/g	07/11/18 18:35	08/03/18 07:01	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S011

Lab Sample ID: 160-29415-11

Date Collected: 07/05/18 09:02

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.675		0.227	0.237	0.700	0.0953	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Radium-228	0.870		0.246	0.262		0.0433	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thallium-208	0.235		0.127	0.129		0.0544	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-228	0.670		0.135	0.152		0.0643	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-232	0.870		0.246	0.262		0.0433	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Thorium-234	0.374	U	0.710	0.711		0.916	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Uranium-235	-0.367	U	0.431	0.433		0.690	pCi/g	07/11/18 18:35	08/03/18 07:01	1
Uranium-238	0.374	U	0.710	0.711		0.916	pCi/g	07/11/18 18:35	08/03/18 07:01	1

Client Sample ID: PE2-RSYC9-U12-S012

Lab Sample ID: 160-29415-12

Date Collected: 07/05/18 09:06

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.589		0.274	0.280		0.109	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Actinium-227	-0.471	U	0.990	0.992		0.798	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Bismuth-212	0.400	U	0.790	0.791		0.608	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Bismuth-214	0.421		0.111	0.119		0.0296	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Cesium-137	-0.0359	U	0.0741	0.0742	0.0700	0.0592	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Cobalt-60	0.0324		0.0407	0.0409	0.200	0.0235	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Lead-210	-1.07	U	1.16	1.16		1.63	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Lead-212	0.537		0.101	0.123		0.0429	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Lead-214	0.461		0.128	0.137		0.0475	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Potassium-40	9.73		1.59	1.88		0.267	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Protactinium-231	0.905	U	3.04	3.04		2.47	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Radium-226	0.421		0.111	0.119	0.700	0.0296	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Radium-228	0.589		0.274	0.280		0.109	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Thallium-208	0.220		0.0772	0.0805		0.0291	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Thorium-228	0.537		0.101	0.123		0.0429	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Thorium-232	0.589		0.274	0.280		0.109	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Thorium-234	0.228	U	0.281	0.282		1.27	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Uranium-235	-0.0573	U	0.361	0.361		0.424	pCi/g	07/11/18 18:35	08/03/18 07:02	1
Uranium-238	0.228	U	0.281	0.282		1.27	pCi/g	07/11/18 18:35	08/03/18 07:02	1

Client Sample ID: PE2-RSYC9-U12-S013

Lab Sample ID: 160-29415-13

Date Collected: 07/05/18 09:10

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.456		0.141	0.148		0.0626	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Actinium-227	0.233	U	0.741	0.741		0.601	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Bismuth-212	0.000	U	0.502	0.502		0.585	pCi/g	07/11/18 18:35	08/03/18 07:03	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S013

Lab Sample ID: 160-29415-13

Date Collected: 07/05/18 09:10

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.374		0.112	0.119		0.0410	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Cesium-137	0.00332	U	0.0474	0.0474	0.0700	0.0387	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Cobalt-60	-0.0328	U	0.0282	0.0284	0.200	0.0513	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Lead-210	-1.15	U	1.27	1.28		1.23	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Lead-212	0.346		0.0865	0.0974		0.0500	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Lead-214	0.453		0.107	0.117		0.0447	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Potassium-40	10.5		1.54	1.88		0.239	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Protactinium-231	0.000	U	0.545	0.545		1.84	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Radium-226	0.374		0.112	0.119	0.700	0.0410	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Radium-228	0.456		0.141	0.148		0.0626	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Thallium-208	0.142		0.0648	0.0665		0.0283	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Thorium-228	0.346		0.0865	0.0974		0.0500	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Thorium-232	0.456		0.141	0.148		0.0626	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Thorium-234	-0.0608	U	1.13	1.13		0.762	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Uranium-235	-0.136	U	0.381	0.382		0.344	pCi/g	07/11/18 18:35	08/03/18 07:03	1
Uranium-238	-0.0608	U	1.13	1.13		0.762	pCi/g	07/11/18 18:35	08/03/18 07:03	1

Client Sample ID: PE2-RSYC9-U12-S014

Lab Sample ID: 160-29415-14

Date Collected: 07/05/18 09:14

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.292		0.288	0.289		0.167	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Actinium-227	0.308	U	0.772	0.773		0.520	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Bismuth-212	0.724		0.571	0.576		0.322	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Bismuth-214	0.551		0.175	0.184		0.0691	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Cesium-137	0.00810	U	0.0716	0.0716	0.0700	0.0576	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Cobalt-60	0.0183	U	0.0831	0.0831	0.200	0.0413	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Lead-210	0.764	U	1.47	1.47		0.984	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Lead-212	0.683		0.119	0.148		0.0434	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Lead-214	0.599		0.152	0.165		0.0540	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Potassium-40	12.2		1.97	2.33		0.331	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Protactinium-231	0.547	U	2.67	2.67		2.17	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Radium-226	0.551		0.175	0.184	0.700	0.0691	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Radium-228	0.292		0.288	0.289		0.167	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Thallium-208	0.268		0.0739	0.0789		0.0174	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Thorium-228	0.683		0.119	0.148		0.0434	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Thorium-232	0.292		0.288	0.289		0.167	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Thorium-234	0.967		1.37	1.38		0.929	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Uranium-235	0.116	U	0.358	0.358		0.292	pCi/g	07/11/18 18:35	08/03/18 07:05	1
Uranium-238	0.967		1.37	1.38		0.929	pCi/g	07/11/18 18:35	08/03/18 07:05	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S015

Lab Sample ID: 160-29415-15

Date Collected: 07/05/18 09:18

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.522		0.151	0.160		0.0964	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Actinium-227	-0.329	U	0.774	0.774		0.624	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Bismuth-212	0.192	U	0.599	0.599		0.475	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Bismuth-214	0.453		0.139	0.147		0.0588	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Cesium-137	-0.0214	U	0.0513	0.0514	0.0700	0.0481	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Cobalt-60	-0.00505	U	0.0220	0.0220	0.200	0.0333	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Lead-210	2.01		1.23	1.25		0.901	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Lead-212	0.502		0.0940	0.114		0.0480	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Lead-214	0.423		0.101	0.110		0.0518	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Potassium-40	11.6		1.44	1.87		0.267	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Protactinium-231	0.0972	U	1.18	1.18		2.07	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Radium-226	0.453		0.139	0.147	0.700	0.0588	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Radium-228	0.522		0.151	0.160		0.0964	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Thallium-208	0.189		0.0651	0.0680		0.0251	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Thorium-228	0.502		0.0940	0.114		0.0480	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Thorium-232	0.522		0.151	0.160		0.0964	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Thorium-234	0.577	U	1.25	1.25		1.01	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Uranium-235	-0.00523	U	0.237	0.237		0.443	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Uranium-238	0.577	U	1.25	1.25		1.01	pCi/g	07/11/18 18:35	08/03/18 07:47	1

Client Sample ID: PE2-RSYC9-U12-S016

Lab Sample ID: 160-29415-16

Date Collected: 07/05/18 09:22

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.785		0.210	0.224		0.0327	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Actinium-227	-0.382	U	1.06	1.06		0.855	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Bismuth-212	0.755		0.460	0.466		0.169	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Bismuth-214	0.434		0.171	0.177		0.0829	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Cesium-137	-0.000510	U	0.0635	0.0635	0.0700	0.0523	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Cobalt-60	0.00203	U	0.0107	0.0107	0.200	0.0299	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Lead-210	2.23		1.81	1.84		1.12	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Lead-212	0.555		0.104	0.119		0.0443	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Lead-214	0.454		0.119	0.128		0.0474	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Potassium-40	12.5		1.65	2.08		0.127	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Protactinium-231	-0.218	U	2.98	2.98		2.45	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Radium-226	0.434		0.171	0.177	0.700	0.0829	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Radium-228	0.785		0.210	0.224		0.0327	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Thallium-208	0.205		0.0634	0.0667		0.0199	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Thorium-228	0.555		0.104	0.119		0.0443	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Thorium-232	0.785		0.210	0.224		0.0327	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Thorium-234	-0.188	U	1.53	1.53		1.26	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Uranium-235	-0.0339	U	0.0561	0.0562		0.370	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Uranium-238	-0.188	U	1.53	1.53		1.26	pCi/g	07/11/18 18:35	08/03/18 07:48	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Client Sample ID: PE2-RSYC9-U12-S017

Lab Sample ID: 160-29415-17

Date Collected: 07/05/18 09:26

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.550		0.195	0.202		0.166	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Actinium-227	0.138	U	0.397	0.398		0.457	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Bismuth-212	-0.0178	U	0.756	0.756		0.479	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Bismuth-214	0.548		0.148	0.158		0.0543	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Cesium-137	-0.0313	U	0.0704	0.0705	0.0700	0.0551	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Cobalt-60	0.0368		0.0683	0.0684	0.200	0.0320	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Lead-210	0.705	U	1.17	1.17		0.803	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Lead-212	0.483		0.105	0.122		0.0540	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Lead-214	0.374		0.107	0.114		0.0750	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Potassium-40	11.4		1.67	2.04		0.260	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Protactinium-231	0.683	U	2.28	2.28		1.85	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Radium-226	0.548		0.148	0.158	0.700	0.0543	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Radium-228	0.550		0.195	0.202		0.166	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Thallium-208	0.199		0.0651	0.0683		0.0226	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Thorium-228	0.483		0.105	0.122		0.0540	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Thorium-232	0.550		0.195	0.202		0.166	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Thorium-234	-0.0234	U	0.0483	0.0483		0.988	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Uranium-235	-0.0147	U	0.314	0.314		0.321	pCi/g	07/11/18 18:35	08/03/18 07:47	1
Uranium-238	-0.0234	U	0.0483	0.0483		0.988	pCi/g	07/11/18 18:35	08/03/18 07:47	1

Client Sample ID: PE2-RSYC9-U12-S018

Lab Sample ID: 160-29415-18

Date Collected: 07/05/18 09:31

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.593		0.336	0.341		0.145	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Actinium-227	0.156	U	0.141	0.142		0.695	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Bismuth-212	0.000	U	0.538	0.538		0.671	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Bismuth-214	0.506		0.146	0.155		0.0663	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Cesium-137	-0.0423	U	0.0944	0.0945	0.0700	0.0747	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Cobalt-60	-0.0521	U	0.120	0.120	0.200	0.0605	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Lead-210	0.154	U	1.62	1.62		1.32	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Lead-212	0.575		0.114	0.136		0.0547	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Lead-214	0.603		0.127	0.141		0.0428	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Potassium-40	12.0		1.81	2.19		0.244	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Protactinium-231	-0.970	U	3.34	3.34		2.72	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Radium-226	0.506		0.146	0.155	0.700	0.0663	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Radium-228	0.593		0.336	0.341		0.145	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Thallium-208	0.242		0.0605	0.0655		0.00881	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Thorium-228	0.575		0.114	0.136		0.0547	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Thorium-232	0.593		0.336	0.341		0.145	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Thorium-234	-1.16	U	1.26	1.27		1.45	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Uranium-235	-0.241	U	0.168	0.170		0.510	pCi/g	07/11/18 18:35	08/03/18 07:48	1
Uranium-238	-1.16	U	1.26	1.27		1.45	pCi/g	07/11/18 18:35	08/03/18 07:48	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-375997/22-A
Matrix: Solid
Analysis Batch: 380120

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375997

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	0.02741	U	0.0701	0.0701	0.331	0.0556	pCi/g	07/16/18 13:23	08/03/18 05:52	1
Carrier	MB MB		Limits		Prepared	Analyzed	Dil Fac			
Sr Carrier	%Yield	Qualifier	Limits					07/16/18 13:23	08/03/18 05:52	1
	90.1		40 - 110							

Lab Sample ID: LCS 160-375997/1-A
Matrix: Solid
Analysis Batch: 379945

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 375997

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Total Beta Strontium	8.21	8.560		0.685	0.331	0.0493	pCi/g	104	75 - 125
Carrier	LCS LCS		Limits		Prepared	Analyzed	Dil Fac		
Sr Carrier	%Yield	Qualifier	Limits					07/16/18 13:23	08/03/18 05:52
	88.9		40 - 110						

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-375038/1-A
Matrix: Solid
Analysis Batch: 379768

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375038

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.05929	U	0.136	0.136		0.0653	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Actinium-227	0.1528	U	0.265	0.266		0.351	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Bismuth-212	0.3444	U	0.971	0.971		0.776	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Bismuth-214	-0.05047	U	0.110	0.110		0.116	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Cesium-137	0.01680	U	0.0344	0.0345	0.0700	0.0255	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Cobalt-60	-0.03100	U	0.0296	0.0297	0.200	0.0476	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Lead-210	-0.1884	U	1.01	1.01		0.821	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Lead-212	0.02616	U	0.0562	0.0563		0.0438	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Lead-214	0.006718	U	0.0732	0.0732		0.0589	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Potassium-40	-0.3654	U	0.524	0.526		0.314	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Protactinium-231	0.0000	U	0.159	0.159		1.37	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Radium-226	-0.05047	U	0.110	0.110	0.700	0.116	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Radium-228	0.05929	U	0.136	0.136		0.0653	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Thallium-208	0.005455	U	0.0215	0.0215		0.0299	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Thorium-228	0.02616	U	0.0562	0.0563		0.0438	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Thorium-232	0.05929	U	0.136	0.136		0.0653	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Thorium-234	0.3218	U	0.803	0.803		0.638	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Uranium-235	0.05829	U	0.122	0.122		0.290	pCi/g	07/11/18 18:35	08/02/18 22:40	1
Uranium-238	0.3218	U	0.803	0.803		0.638	pCi/g	07/11/18 18:35	08/02/18 22:40	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-375038/2-A
Matrix: Solid
Analysis Batch: 379773

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 375038

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	97.60		10.3		0.620	pCi/g	101	87 - 116
Cesium-137	28.2	28.34		3.06	0.0700	0.113	pCi/g	100	87 - 120
Cobalt-60	12.9	12.53		1.34	0.200	0.0186	pCi/g	97	87 - 115

Lab Sample ID: 160-29415-1 DU
Matrix: Solid
Analysis Batch: 379767

Client Sample ID: PE2-RSYC9-U12-S001
Prep Type: Total/NA
Prep Batch: 375038

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.436		0.5397		0.231		0.0740	pCi/g	0.23	1
Actinium-227	0.309	U	-0.08583	U	0.146		0.896	pCi/g	0.48	1
Bismuth-212	0.000	U	0.2443	U	0.807		0.641	pCi/g	0.15	1
Bismuth-214	0.644		0.4617		0.158		0.0693	pCi/g	0.54	1
Cesium-137	-0.0142	U	-0.04751	U	0.0820	0.0700	0.0636	pCi/g	0.19	1
Cobalt-60	0.0112	U	-0.02369	U	0.0893	0.200	0.0429	pCi/g	0.27	1
Lead-210	0.294	U	1.940		2.12		1.29	pCi/g	0.53	1
Lead-212	0.595		0.5151		0.125		0.0600	pCi/g	0.30	1
Lead-214	0.672		0.5227		0.130		0.0663	pCi/g	0.51	1
Potassium-40	11.3		11.89		2.02		0.128	pCi/g	0.14	1
Protactinium-231	0.000	U	0.4100	U	1.67		2.62	pCi/g	0.20	1
Radium-226	0.644		0.4617		0.158	0.700	0.0693	pCi/g	0.54	1
Radium-228	0.436		0.5397		0.231		0.0740	pCi/g	0.23	1
Thallium-208	0.196		0.2725		0.0808		0.0232	pCi/g	0.48	1
Thorium-228	0.595		0.5151		0.125		0.0600	pCi/g	0.30	1
Thorium-232	0.436		0.5397		0.231		0.0740	pCi/g	0.23	1
Thorium-234	0.772	U	-0.1520	U	1.63		1.34	pCi/g	0.33	1
Uranium-235	0.286	U	-0.2715	U	0.643		0.573	pCi/g	0.62	1
Uranium-238	0.772	U	-0.1520	U	1.63		1.34	pCi/g	0.33	1

QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Rad

Leach Batch: 374782

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29415-1	PE2-RSYC9-U12-S001	Total/NA	Solid	Dry and Grind	
160-29415-2	PE2-RSYC9-U12-S002	Total/NA	Solid	Dry and Grind	
160-29415-3	PE2-RSYC9-U12-S003	Total/NA	Solid	Dry and Grind	
160-29415-4	PE2-RSYC9-U12-S004	Total/NA	Solid	Dry and Grind	
160-29415-5	PE2-RSYC9-U12-S005	Total/NA	Solid	Dry and Grind	
160-29415-6	PE2-RSYC9-U12-S006	Total/NA	Solid	Dry and Grind	
160-29415-7	PE2-RSYC9-U12-S007	Total/NA	Solid	Dry and Grind	
160-29415-8	PE2-RSYC9-U12-S008	Total/NA	Solid	Dry and Grind	
160-29415-9	PE2-RSYC9-U12-S009	Total/NA	Solid	Dry and Grind	
160-29415-10	PE2-RSYC9-U12-S010	Total/NA	Solid	Dry and Grind	
160-29415-11	PE2-RSYC9-U12-S011	Total/NA	Solid	Dry and Grind	
160-29415-12	PE2-RSYC9-U12-S012	Total/NA	Solid	Dry and Grind	
160-29415-13	PE2-RSYC9-U12-S013	Total/NA	Solid	Dry and Grind	
160-29415-14	PE2-RSYC9-U12-S014	Total/NA	Solid	Dry and Grind	
160-29415-15	PE2-RSYC9-U12-S015	Total/NA	Solid	Dry and Grind	
160-29415-16	PE2-RSYC9-U12-S016	Total/NA	Solid	Dry and Grind	
160-29415-17	PE2-RSYC9-U12-S017	Total/NA	Solid	Dry and Grind	
160-29415-18	PE2-RSYC9-U12-S018	Total/NA	Solid	Dry and Grind	
160-29415-1 DU	PE2-RSYC9-U12-S001	Total/NA	Solid	Dry and Grind	

Prep Batch: 375038

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29415-1	PE2-RSYC9-U12-S001	Total/NA	Solid	Fill_Geo-21	374782
160-29415-2	PE2-RSYC9-U12-S002	Total/NA	Solid	Fill_Geo-21	374782
160-29415-3	PE2-RSYC9-U12-S003	Total/NA	Solid	Fill_Geo-21	374782
160-29415-4	PE2-RSYC9-U12-S004	Total/NA	Solid	Fill_Geo-21	374782
160-29415-5	PE2-RSYC9-U12-S005	Total/NA	Solid	Fill_Geo-21	374782
160-29415-6	PE2-RSYC9-U12-S006	Total/NA	Solid	Fill_Geo-21	374782
160-29415-7	PE2-RSYC9-U12-S007	Total/NA	Solid	Fill_Geo-21	374782
160-29415-8	PE2-RSYC9-U12-S008	Total/NA	Solid	Fill_Geo-21	374782
160-29415-9	PE2-RSYC9-U12-S009	Total/NA	Solid	Fill_Geo-21	374782
160-29415-10	PE2-RSYC9-U12-S010	Total/NA	Solid	Fill_Geo-21	374782
160-29415-11	PE2-RSYC9-U12-S011	Total/NA	Solid	Fill_Geo-21	374782
160-29415-12	PE2-RSYC9-U12-S012	Total/NA	Solid	Fill_Geo-21	374782
160-29415-13	PE2-RSYC9-U12-S013	Total/NA	Solid	Fill_Geo-21	374782
160-29415-14	PE2-RSYC9-U12-S014	Total/NA	Solid	Fill_Geo-21	374782
160-29415-15	PE2-RSYC9-U12-S015	Total/NA	Solid	Fill_Geo-21	374782
160-29415-16	PE2-RSYC9-U12-S016	Total/NA	Solid	Fill_Geo-21	374782
160-29415-17	PE2-RSYC9-U12-S017	Total/NA	Solid	Fill_Geo-21	374782
160-29415-18	PE2-RSYC9-U12-S018	Total/NA	Solid	Fill_Geo-21	374782
MB 160-375038/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-375038/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29415-1 DU	PE2-RSYC9-U12-S001	Total/NA	Solid	Fill_Geo-21	374782

Prep Batch: 375997

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29415-1	PE2-RSYC9-U12-S001	Total/NA	Solid	DPS-0	374782
160-29415-11	PE2-RSYC9-U12-S011	Total/NA	Solid	DPS-0	374782
MB 160-375997/22-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-375997/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29415-2

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Sr Carrier (40-110)	Percent Yield (Acceptance Limits)
160-29415-1	PE2-RSYC9-U12-S001	89.2	
160-29415-11	PE2-RSYC9-U12-S011	88.9	
LCS 160-375997/1-A	Lab Control Sample	88.9	
MB 160-375997/22-A	Method Blank	90.1	

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

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